A Survey of Venture Capital in Europe

Implications for the Chinese Venture Capital Market

Qian Yafengyun

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Preface

With this thesis, my study as a master student in the University of Oslo ends, but what I've learned here will become an invaluable treasure in my life. In this very moment, I want to thank all those who have helped me during my campus life.

Special thanks to my supervisor Karen Helene Ulltveit-Moe. Thanks for all those time that she has been spent on the supervision. Her kindness in giving insightful feedbacks and warming supports makes this paper a possible.

I'm also grateful for all those lecturers who make economics an exciting world for master students. Thanks to Nils Christian Framstad, the mathematics 3 is my favorite, and Nils is the most considerate lecturer I've ever met, with everything prepared for his students. I'd also like to thank Kjell Arne Brekke, Geir B. Asheim, Aanund Hylland, Jon Vislie, Halvor Mehlum, Karine Nyborg etc. for their wonderful lectures.

Gratitude goes to Olav who promotes this program in China and the government of Norway which provides Quota Scheme to make my study in Norway convenient. Also thank all the friends here that make life interesting. Finally, I want to thank my parents for thier consistent support in my life.

Summary

Despite the rapid growth of the European VC market, few Chinese academic researchers have studied it. In this paper, I make a detailed description of the European venture capital market, and hope to withdraw some lessons from Europe for the development of the venture capital market in China.

After some theoretical reviews about the definition of venture capital, the structure of a venture capital market and the determinants of venture capital investments, the paper describes the history and recent developments in the European venture capital market. The items covered include fundraising, source of funding, investment volume, stage distribution of investment, industrial distribution of investment, the internal rate of return for different kind of venture capital investments and the legal and tax environment for venture capital in Europe. I hope these latest data can be informative for academics, regulators and VC fund managers alike in China.

Then I discuss the economic impact of venture capital on the sustainable economic growth, innovation and job creation in European. Most government agencies and researchers claimed that venture capital investment is beneficial to innovations and job creations. The survey of EVCA also provides data to support these ideas. Job creations in venture-backed firms are much higher than traditional companies, and the innovation activities in these companies are also higher than the average.

The survey of the European venture capital market finds that the development of the venture capital market is quite imbalanced in Europe. To answer the question what determines the equilibrium amount of venture capital investments in a country, I develop models to explain it. The basic model is similar to that developed by Romain and van Pottelsberghe (2003). However, I introduce a microeconomic perspective to construct the supply function of VC funds. And I also extend the model by including the legal environment in the demand function of VC funds.

The empirical analysis is run, using the dataset covering 15 European countries over the period 2002-2008. Other than previous researches, I use the public R&D

expenditures to reflect the entrepreneurial environment of the economy, because I want to find whether public R&D expenditures can be used as a policy tool to stimulate the venture capital activities in a country. The regression results show that the venture capital investment is positively related to the GDP growth rate, depth of the capital market, entrepreneurial environments and public R&D expenditures. However, my analysis focus is on how legal environments and the type of legal system matters in the determination of VC investments. The analysis shows that a bad legal environment will diminish the effectiveness of public R&D expenses on VC investments. And whether a country adopts case law tradition also influences the effectiveness of public R&D expenses on VC investments.

After that, the paper analyzes the recent development of the venture capital market in China, makes a comparison with the Europe and concludes some potential problems hindering the development of VC market in China. At last I provide some policy suggestions for Chinese government using experience from Europe, including speeding up the construction of a multi-level capital market in China, making more public investments in scientific researches and education programmes and creating a favourable environment for venture capital activities.

Contents

Figures and Tables

1. Introduction

Since it first emerged in 1940s in the United States, the venture capital has gone through a 70-year's history of development. However, it is still quite a mystery for many people, especially those in developing countries like China.

The emergence of VC industry was to some extent triggered by the fact that most small and medium-sized business (SMEs) were in shortage of capital for daily operation or expansion. And venture capital could serve as an important financing source for those companies. Researches also find that the venture capital activity has a positive impact not only on the promotion of enterprises but also on economic growth. Astrid Romain and Bruno van Pottelsberghe (2003) found the positive relationship between the venture capital activity and the economic growth with panel data of 16 OECD countries from 1990 to 1998.

Besides, venture capital can boost the prosperity of innovation activities. Florida and Smith (1990) found that the venture capital activity was closely related to high-tech resources. The correlation coefficient between the number of VC firms and the number of high-tech companies was 0.954, and the coefficient between the amount of VC investment and the number of high-tech companies was 0.982. Samuel Kortum & Josh Lerner (2000) illustrated that the increasing of venture capital would increase the number of patents. And they estimated that the contribution of venture capital to the amount of innovations in U.S. was about 8% during 1983 to 1992.

What's more venture capital is also helpful for the creation of jobs. Dirk Engel (2004) checked the job creation function of European VC investments by comparing European surviving venture-backed firms with surviving non-venture-backed firms and found that the number of employees in venture-backed grew much quicker than those without venture backgrounds.

These three functions of venture capital were especially meaningful for the European economy which has suffered from the high unemployment rate and the low economic growth rate for quite a long time. The European Union (EU) and governments of

most European countries pay an extraordinary attention to the development of their VC markets. As a result, the European venture capital market has become the second largest among all regions in the world.

Despite the rapid growth of the European VC market, it still hasn't drawn attention from Chinese academic researchers. As I can find from WanFang[1] database, only a handful of papers explore the issue in Europe, most of which with extremely old set of data. And venture capital itself is quite new to the Chinese economy. As the second board[2] was launched in October 2009 in China, the surge of venture capital investments is about to come. At this very moment, make a detailed exploration of the world's second largest venture capital market will give us lots of apocalypses and lead us to the right way of better developments.

In this paper, I wish to picture a vast panorama of the European venture capital market, which would be informative for academics, regulators and VC fund managers alike. The paper will be arranged as follows. After some theoretical reviews about the definition of venture capital, the structure of a venture capital market and the determinants of venture capital investments in Section 2, Section 3 gives a short review of the history of European venture capital. Section 4 illustrates the recent developments in the European VC market; describes the legal and tax environment and checks out the economic impact of VC activities on the European economy. Section 5 establishes models to find potential factors that determine the equilibrium amount of venture capital investments. And Section 6 runs an empirical test on 15 European countries over the period 2002-2008, using the model derived from section 5. The software for running regression analysis is Stata 8. After some description of Chinese VC developments in recent years in section 7, section 8 makes a conclusion and provides some policy suggestions for Chinese governments about the future development of venture capital market in China.

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[1] A Chinese paper database that compromises most academic papers in China.

[2] The second board refers to the seperate market for smaller companies that haven't meet requirements of main board listing. NASDAQ is the most famous second board in the world.

2. Definition and overview

2.1 Definition

The definition of venture capital itself is somewhat ambiguous and has different meanings in different situations. In US, venture capital refers to a subset of private equity that provides capital for early-stage, high-potential and growth companies. As the academic authority Paul Gompers and Josh Lerner (1997) define, venture capital investments are investments in equity or equity-linked securities of private firms, with active participation by the fund managers in the management or oversight of the firms. However, the meaning of venture capital in Europe is interchangeable with private equity. The European venture capital and private equity association (EVCA) defines venture capital or private equity as providing equity capital to enterprises not quoted on a stock market. In this paper, I'll follow the European tradition and use the latter definition of venture capital.

2.2 The structure of a venture capital market

There are lots of players in a venture capital market that can be divided into three categories: investors, intermediaries and portfolio companies. Investors in the market include financial institutions like banks, pension funds etc., corporations and wealthy individuals. Portfolio companies refer to those high growth-potential ventures that receive venture capital investments. And venture capital firms serve as intermediaries to transfer money from investors to portfolio companies. These three kinds of players compose the organism of a complete venture capital market.

The function of the venture capital market is quite similar to that of the stock market. Actually it is a subset of the capital market, serving as an important channel of direct financing. The differences lie in the fact that companies receiving external financing in the venture capital market are generally too small to be listed on the stock market and venture capital firms usually give more management supports to their portfolio companies, while most investors in the stock market don't involve in the daily

business of their investee companies. The figure below describes the typical process of venture capital investments.

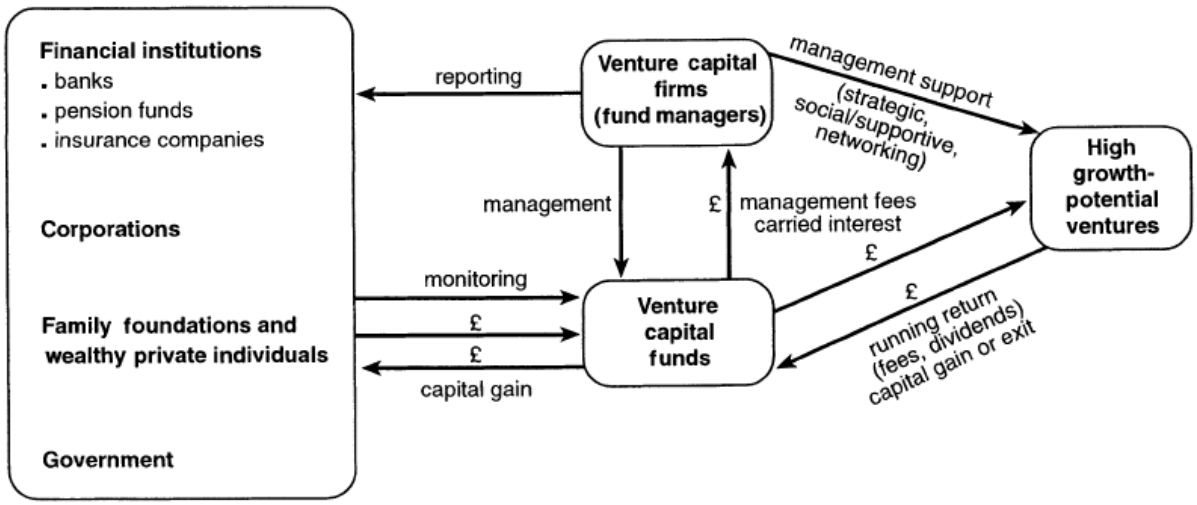

Figure 2. 1 The venture capital investment process. Source: Mason and Harrison, 2002

2.3 What determines venture capital investments?

So what makes a country's venture capital market thriving, or what determines venture capital investments in a country? Some articles try to answer the problem from macroeconomic perspective. Romain and van Pottelsberghe (2003) wrote that only two articles attempted to evaluate quantitatively the macroeconomic determinants of VC so far: Jeng and Wells (2000) develop a model and test it on a cross-section of 21 countries over a period of 10 years. Gompers and Lerner (1998) do the test on the US economy over the period 1969-1994. Romain and van Pottelsberghe (2003) themselves improve the theoretical model and conclude that the determinants of VC are related to macroeconomic conditions, research efforts, technology opportunity and the entrepreneurial environment. Their model is econometrically evaluated with a panel dataset of 16 OECD countries over the period 1990-1998. Bonini and Alkan (2009) further developed the model to include political factors like corruption, internal conflicts and socio-economic conditions etc. The main results of their research can be summarized as the following table.

Table 2. 1 Potential determinants of VC investments

Potential Determinants	Bonini and Alkan (2009)	Romain and van Pottelsberghe (2003)	Jeng and Wells (2000)	Gompers and Lerner (1998)
Economic Variables				
IPO	Not significant	n.a.	Postive, except for early stage funds	No effect at aggregate level
GDP Growth	Not significant	Positive	Not significant	Postive
Stock Market	Postive	n.a.	Not significant	Postive
Interest Rates	Negative	Positive	n.a.	Postive at aggregate level, negative at state level
Inflation	Negative	n.a.	n.a.	n.a.
Technology 0pportunities				
R&D	Postive	Positive	n.a.	Positive at state level
R&D Capital stock	n.a.	Positive	n.a.	n.a.
Patent	n.a.	Positive	n.a.	n.a.
Entrepreneurial Environment				
Labor ,Market Rigidties	Negative in early stage funds	Negative	Not significant for total VC investments but negative for early stage funds	n.a.
Corporate Gains Tax Rate	Negative	Negative	Not significant	Negative
Level of Entreprenuership	n.a.	Positive	n.a.	n.a.

Political Risks				
Currption	Negative in early stage funds	n.a.	n.a.	n.a.
Socio-economic Conditions	Postive	n.a.	n.a.	n.a.
Internal Conflicts	Negative in early stage funds	n.a.	n.a.	n.a.

Source: Romain and van Pottelsberghe (2003), Bonini and Alkan (2009)

Others explain the problem from the perspective of legal environment. La Porta et al. (1997) proves that the legal environment is crucial for the size and the activeness of a country's venture capital market. Cumming et al. (2006) find that a well developed legal system is more important for venture capital divestments than a well developed capital market is. Pukthuanthong et al. (2007) analyze the relationship between European venture capital investments and the legal system, and find that an independent judiciary and a dynamic legal system are important contributors to a thriving venture capital market.

3. The history of European venture capital

The emergence of modern European venture capital industry dated back to the late 1970s, when UK and Ireland among all European countries attracted venture capitalists first. At that time most venture capital funds in Europe were initiated by American venture capital firms. Continental Europe followed in the early 1980s, where VC funds were frequently set up by large domestic banks (Andreas et al, 2007). Today the volume of European venture capital market rank the second among all regions over the world. Figure 3. 1 illustrates the geographic distribution of venture capital investments around the world. U.S. occupied about 45% of the total global VC investments, while European followed with about 24% of the market share. According to the statistics of European Venture Capital Association (EVCA), UK, France and German were the top three countries in Europe that receive most venture capital investments in 2008, with 1.78 billion euro, 875 million euro and 428million euro respectively. And they are also the most active economy entities with regard to venture capital. Exploring the development history of VC industries in these countries would give us a detailed insight about that of the Europe.

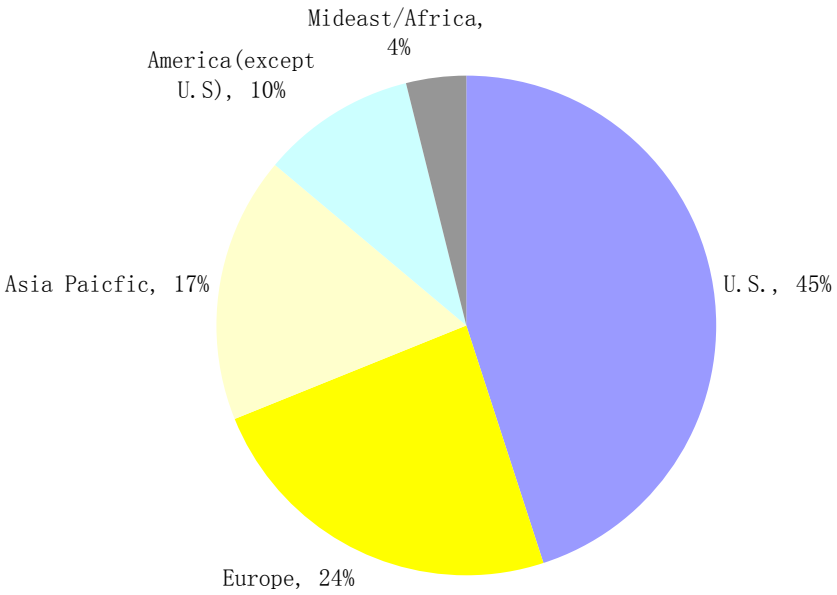

Figure 3. 1 The geographical distribution of global venture capital investments. Source: Chinese Venture Capital Yearbook 2007

3.1 UK

For quite a long time, changing the unfavourable environment for small and medium-sized enterprises (SMEs) had always been a big problem facing the UK government. As early as 1931, The MacMillan Committee Report stated that there was a chronic shortage of long term investment capital for SMEs in UK. And it recommends forming a company “to devote itself particularly to these smaller industrial and commercial issues.” After World War II, two companies, Industrial and Commercial Financial Corporation (ICFC) and Finance Corporation for Industry (FCI), were established to solve this financing problem facing small and medium-sized business by providing long term and permanent capital, the foundation of which declared the beginning of venture capital in England. These two companies were merged into one in 1970s and rebranded to Investors in Industry (3i), which now is still an active player in private equity market with 8 billion pounds under management.

Partially due to supportive government policies and evolutions of the financial market, the number of English venture capital firms began to surge since 1980. The cut of the top rate of income tax in 1979 by Mrs Thatcher’s government stimulated a more entrepreneurial economy. The government further released the Business Start-up Scheme which provided tax incentives for private investors who invested in unquoted companies (Mason and Harrison, 2002). In 1981, London Stock Exchange initiated an Unlisted Securities Market, which facilitated the flotation of SMEs’ equity and provided an exit route for venture capital investments. These three major events laid a solid foundation for the development of UK venture capital market in the following decades.

The venture capital activities show a strong cyclic characteristic during its development in Britain. The total volume of VC investments in UK kept increasing until it peaked at 1.4 billion pounds in 1989. Then it shifted into a period of stagnation till 1993, during which lots of financial institutions stopped their businesses in venture capital. From 1993 to 2000, the market boomed again and reached 6.4 billion pounds in 2000, five times the number of early years in 1990s.

However, the burst of the internet bubble in that year severely damaged venture capital markets around the world. One year later, the investment volume shrank to 4.8 billion pounds, about 75% of that of the previous year. This recession continued until 2003 when the market became to recovery. In 2007, the volume of venture capital investment in UK was about 12 billion pounds, much higher than its previous peak. Comparing that the market volume in US today is still running at about 75% of its peak, the development in Britain is much quicker than US in recent years.

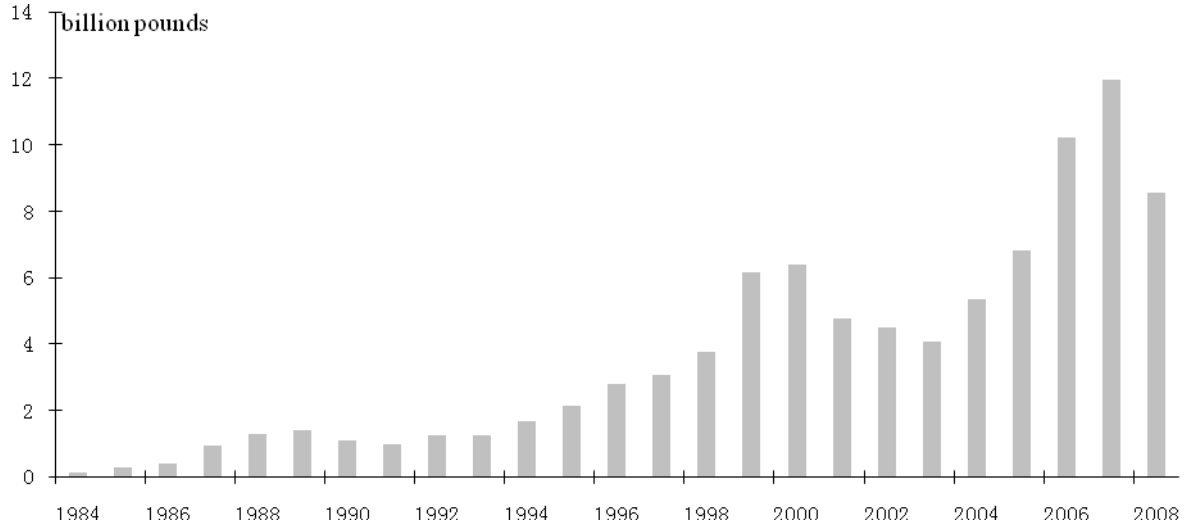

Figure 3. 2 The Venture Capital Investment in UK from 1984 to 2008. Source: BVCA Private Equity and Venture Capital Report on Investment Activity 2007, EVCA Yearbook 2009

The boom of UK venture capital market after 1990s was closely related to the prosperity of VC industry in US. A large amount of capital flew from America to the other side of the ocean for diversification of risks. According to a survey of British Venture Capital Association (BVCA), among all the capital raised by independent venture capital funds during 1997 and 2000, about 41% came from American investors. This kind of “spill-over” phenomenon also occurs in other European countries’ venture capital markets, reflecting the globalization characteristic of venture capital flows.

Since the establishment of the modern venture capital market in 1980s, the prior investment stage of British VC investments also keep changing. More and more venture capitalists put emphasis on MBO and MBI projects, while investments in start-ups are declining. There several reasons for this trend, including the higher return of MBO investments and shortage of classic venture capital skills (Mason and Harrison, 2002). Table 3. 1 illustrates that the ratio of capital invested in start-ups declines from 27.1% in 1984 to only 4% in 2008, while investments in MBO/MBI increase from 20.7% to 59% at the same period.

Table 3. 1 Venture Capital Investment by Stage

	Early stage (%)	Expansion (%)	MBO/MBI (%)
1984	**27.1**	**52.1**	**20.7**
1985	**18.1**	**43.3**	**38.6**
1986	**22.4**	**32.3**	**45.3**
1987	**12.8**	**32.2**	**54.9**
1988	**10**	**33.5**	**56.5**
1989	**15.1**	**23.8**	**61.1**
1990	**11.6**	**35.8**	**52.6**
1991	**5.9**	**39.1**	**55**
1992	**6.6**	**28.9**	**64.5**
1993	**5.6**	**31.9**	**62.5**
1994	**4.6**	**28.8**	**66.7**
1995	**4**	**23.1**	**72.9**
1996	**4.7**	**21.1**	**74.2**
1997	**5.2**	**29.6**	**65.2**
1998	**7.6**	**21.8**	**70.6**
1999	**5.6**	**18.7**	**75.6**
2000	**11**	**33.3**	**55.6**
2001	**8.21**	**34.43**	**57.37**

2002	**6.58**	**30.67**	**62.75**
2003	**6.46**	**21.28**	**72.26**
2004	**5.32**	**17.88**	**76.80**
2005	**5.61**	**28.64**	**65.76**
2006	**9.25**	**29.28**	**61.47**
2007	**3.63**	**31.88**	**64.49**
2008	**4**	**37**	**59**

Source: BVCA Private Equity and Venture Capital Report on Investment Activity 2007, EVCA Yearbook 2009

3.2 France

France has the largest venture capital market in Continental Europe, second only to UK. The VC industry of France started in 1970s, composing of several technology innovations investment companies. The whole industry grew slowly at that time. In the late 1980s, government issued a series of incentive policies, including expanding the fundraising sources for venture capital and tax reduction regimes for VC investments. These policies trigger the rapid growth of French VC industry. The opening of Le Nouveau Marche in 1996 which has a lower threshold for SMEs to go public provided an important exit route for venture capitalists.

Since 2000, the amount of venture capital investment has increased rapidly. In year 2003, the Ministry of Research and the Ministry of Industry jointly promulgated the “Innovation Plan”, which give business angels significant tax exemptions and reductions and also offered sufficient tax incentives to encourage young innovatory SMEs to invest in R&D projects. These policies accelerate the process of transforming research results into business products and create a suitable environment for the venture capital industry. Unlike UK, the VC industry in France was heavily influenced by the burst of internet bubble. The investment in 2003 was actually higher than that of 2000, which to some extent was stimulated by the favourable policies of the French government. According to the latest statistics of EVCA, the

total amount of VC investment in 2008 was 8.7 billion euro, about 70% of investments in UK.

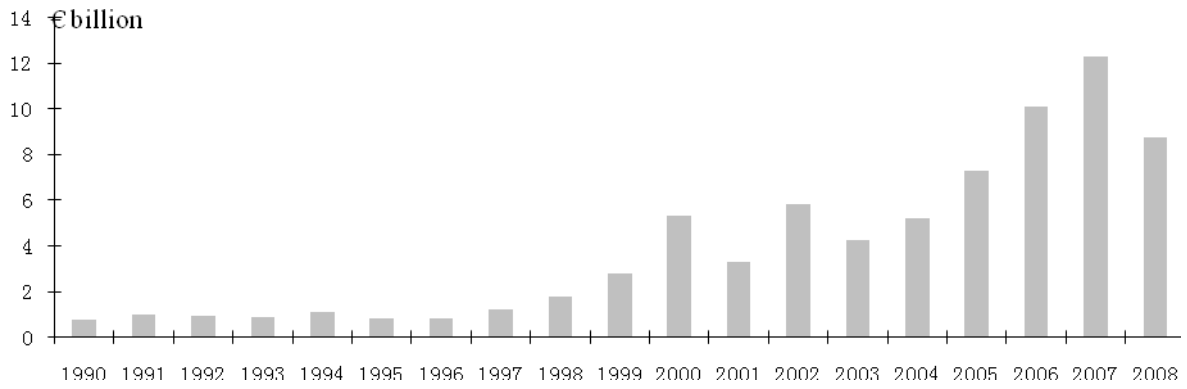

Figure 3. 3 The Venture Capital Investment in France from 1990 to 2008. Source: EVCA Yearbook 2009

3.3 German

The development of venture capital in German is relative slow compared with UK and France, and it can be divided into six phases:

The first period was 1960s when venture capital industry of German was born. During that time, small and medium sized business in German was in lack of sufficient funds for development. To solve the problem, the government of German suggested to found equity investment companies (KBGs) through which providing external long-term capital to SMEs. Like investment funds, KBGs collect capital from various financiers and invest it in a portfolio of companies. Such investments were to be in the form of a silent partnership and entrepreneur should buy back KBGs' share in 5-10 years. In 1965 the first KBGs were founded, many of them as subsidiaries of banks (Krahnen and Schmidt, 2004).

The second phase last from 1970 to 1980. During this period, two types of venture capital companies were established, namely MBGs and WFGs. MBGs provided SMEs with operation capital, but they seldom interfered with internal affairs of the portfolio companies. And they were not allowed to make investment in high-tech

start-ups. And the establishment of WFGs substituted MBGs in those blank areas whose main duty were to grant funds to SMEs' technology innovation.

The third phase started from 1980 till 1996. At this period, the German VC industry began to expand. The US venture capital mode was broadly accepted by their Germany counterparts. More and more local VC firms established and a number of foreign VC institutes opened their offices in German. And the government also published a series of encouraging policies for venture capital investments. Although the market turned to be active, the total amount invested by VC industry was still small.

The fourth phase started in 1997 and end in 2001. The most important event during that period was the establishment of the Neuer Market. It serves as a further exit route for venture capitalists. Since then, the VC market in German began to boom. Before the burst of the internet bubble, the amount of VC investments in German was about 10 times the amount of last period's average.

The industry has been stabilising and consolidating since 2001. Companies, mainly in the venture capital market, are exiting the market due to consolidation (BVK, 2008). As a result, early and later stage VC investments declined dramatically, while buyout investments kept rising and became the most important investment stage for VC funds in German.

At the end of 2004, the market began to grow again and reached 7.45 billion euro in 2007. Figure 3. 4 describes the last four phases since 1990. Compared with the VC industries in UK and France, the venture capital market in Germany was obviously smaller. According to EVCA statistics, the total amount invested in German in 2007 was about 60% of that in France and 21.7% that in Britain.

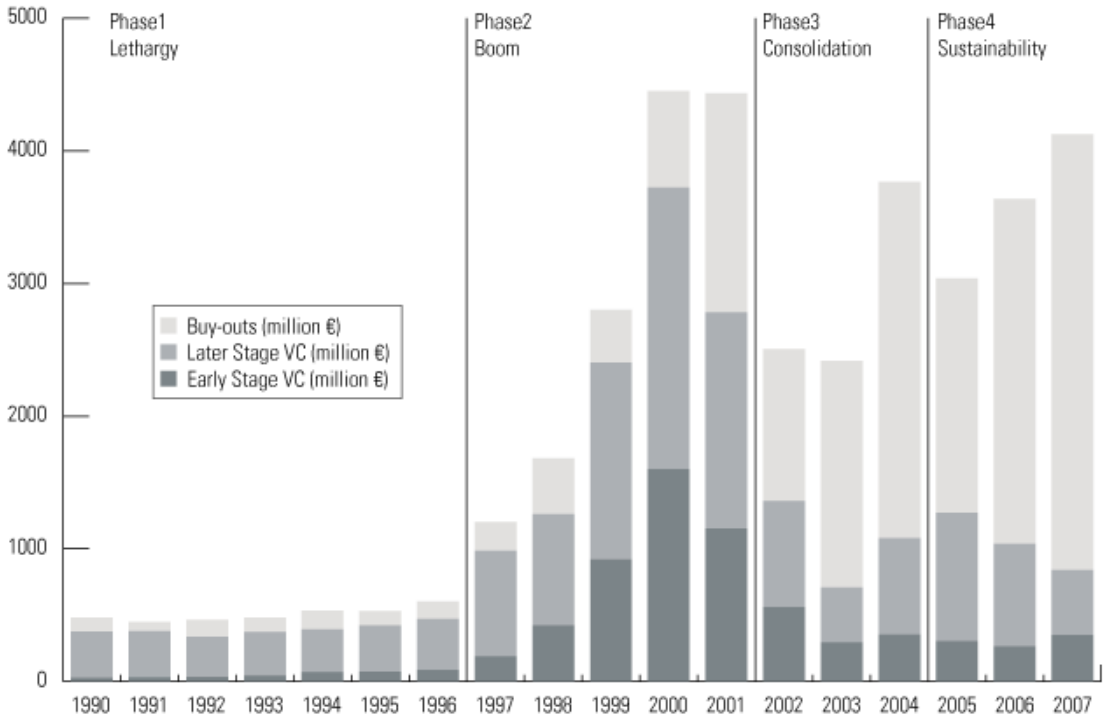

Figure 3. 4 Venture Capital Investments in German from 1990 to 2007
Source: BVK Statistics

4. Recent developments of venture capital in Europe

4.1 Description of venture capital activities

4.1.1 Fundraising activity

Since the burst of the internet bubble in 2000, the venture capital market in Europe, like all the other places around the world, suffered from 4-years' recession. However, the fund raised by European VC firms increased abruptly in 2005, and was kept at high levels in the following three years. The total amount raised in 2006 was two times the amount of 2000, the previous peak in European history. The rapid growth of the European market surpasses the performance of US market in recent two years. Although American VC industry is also recovering in these years, the total market volume in 2007 was only about 70% of the amount in 2000. There are huge discrepancies among European countries with regard to fundraising. In 2008, top 5 countries accounted for almost 88% of the total amount raised in Europe. The UK VC market ranked the first with 46.3 billion euro, about 59% of the total amount. France and Sweden followed with 13.69% and 8.38% respectively.

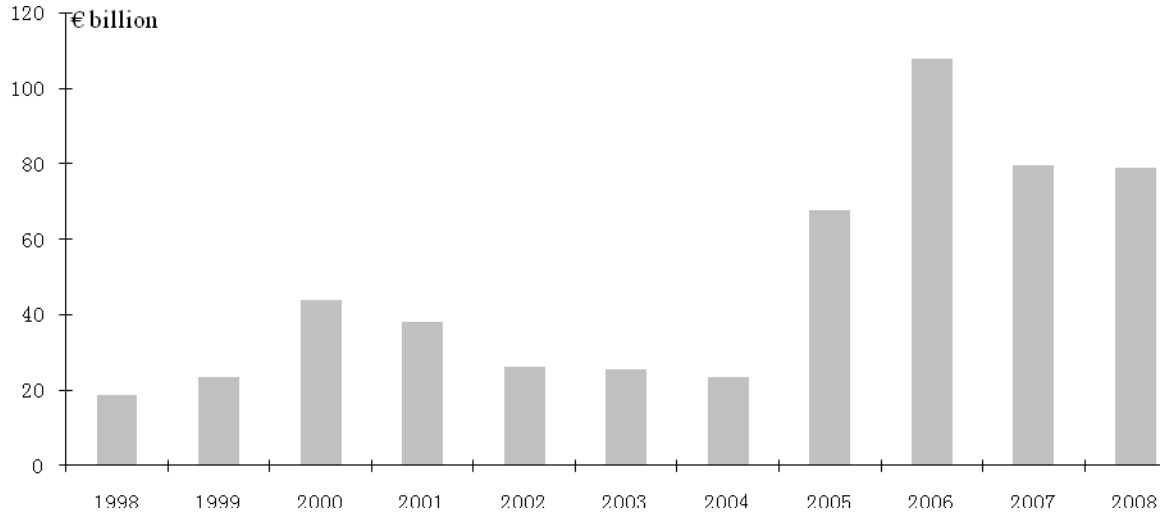

Figure 4. 1 European venture capital fundraising activity, 1998-2008.
Source: EVCA Yearbook 2009

Table 4. 1 European fundraising activity by countries, 2008

Country	Fundraising (€million)	% of total european amount
UK	46334	58.84%
France	10778	13.69%
Sweden	6597	8.38%
Switzerland	3051	3.87%
Deutschland	2400	3.05%
Spain	2224	2.82%
Netherlands	1579	2.01%
Italy	1455	1.85%
Norway	1268	1.61%
Finland	903	1.15%
Others	2159	2.74%
European Total	**78748**	**100.00%**

Source: EVCA Yearbook 2009

4.1.2 Fundraising sources

With regard to fundraising sources, pension funds, fund of funds (FOF), banks and insurance companies are major investors in the venture capital market of Europe. In 2008, the capital provided by pension funds accounted for 25.1 percent of the total amount. FOFs and banks followed with 14.4% and 6.7% respectively. Figure 4. 2 illustrates some changes in European venture capital fundraising sources as follows:

Firstly, the importance of corporate investors in European venture capital market is becoming lower and lower. In 1998 corporate investors contributed about 10.3% of all the capital raised by venture capital funds, which ranked the third among all type of investors. But today they have become the least important type of investors which only provide 2.9% of the total amount in 2008. The logic behind this trend is that independent funds play a more and more important role in recent years. In the early days of the VC history in Europe, a large number of industrial companies established

their venture capital departments and made investments in small and medium-sized firms. These funds were usually called captive funds and were once active players in the market. However, most industrial companies closed their venture capital business after several rounds of market boom and bust. As a result, funds raised from corporate investors declined.

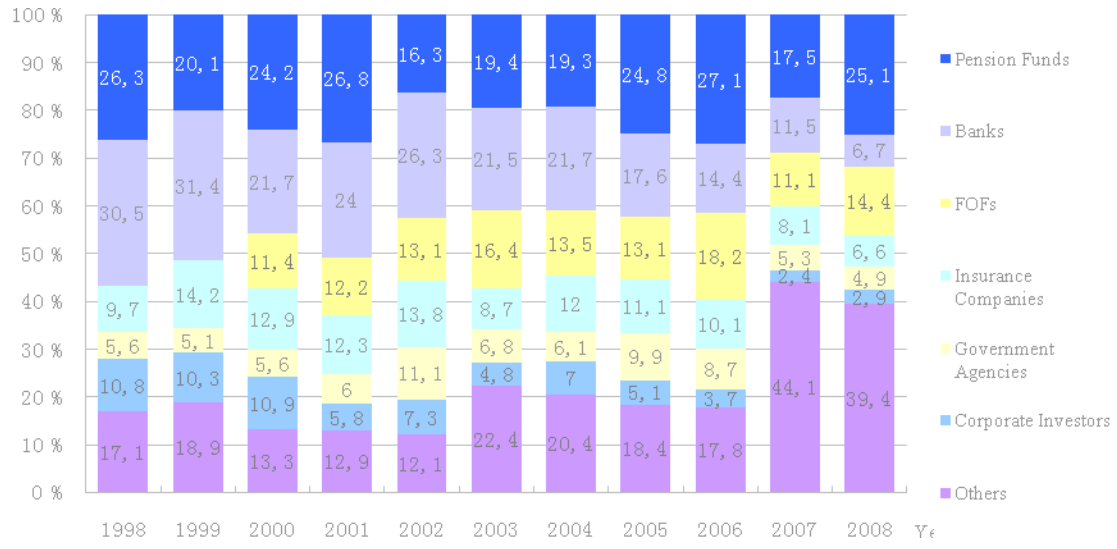

Figure 4. 2 Type of investors in the European VC market. Source: EVCA Yearbook 2009

Secondly, the importance of banks as capital providers is also declining dramatically. In 1998, banks are the most important type of investors in the VC market, accounting for 30.5% of the total. Although they are still the third important investors today, the amount of capital provided by them occupied only 6.7% of the total amount raised in Europe, the largest decline among all the type of investors. It reflects that the European financial system was heavily dependent on banks before, but was now more close to that of the US. The establishment of multi-level capital market helped the diversification of financing sources, alleviating the heavy burden on banking system.

Thirdly, the FOFs and other sources play a more and more important role in the VC market. Combined with the second point above, they all illustrate the diversification

trend of financing sources for European venture capital funds, which implies that the venture capital market mode of Europe is turning similar to that of America.

4.1.3 Investment activity

Similar to fundraising, the European investment amount has been recovering since it declined in 2001, and reached a new record high of 73.8 billion euro in 2007. British VC companies invested 22.5 billion euro in 2008, about 41.61% of the total European investments and ranked the first among all European countries. France and German ranked the second and third with 16.21% and 13.08% respectively. As Figure 4. 3 shows that top five countries occupied almost 83% of the total amount invested by European venture capital companies, reflecting that VC investment activities are highly concentrated in some countries in Europe.

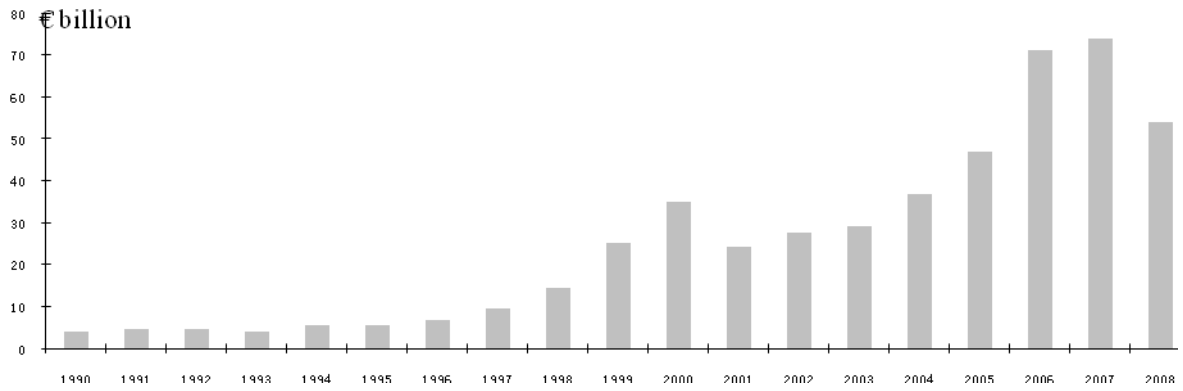

Figure 4. 3 European venture capital investment activity from 1990-2008. Source: EVCA Yearbook 2009

Table 4. 2 European VC Investments by countries, 2008

Country	Investments(€million)	% of european total
UK	22525	41.61%
France	8772	16.21%
Deutschland	7082	13.08%
Sweden	3404	6.29%

Italy	3071	5.67%
Spain	1842	3.40%
Netherlands	1788	3.30%
Switzerland	1307	2.41%
Norway	756	1.40%
Others	3582	6.62%
European total	**54129**	**100.00%**

Source: EVCA Yearbook 2009

4.1.4 Stage distribution of investmets

Taking a close eye to the stage distribution of VC investments, buyout investments have been dominating the market and keep increasing in recent years. As Figure 4. 4 illustrates, the percent of fund invested in buyouts increased from 51% in 1998 to 79% in 2007. At the mean time, the percent of venture investments decreased from 40% to 13.14%.

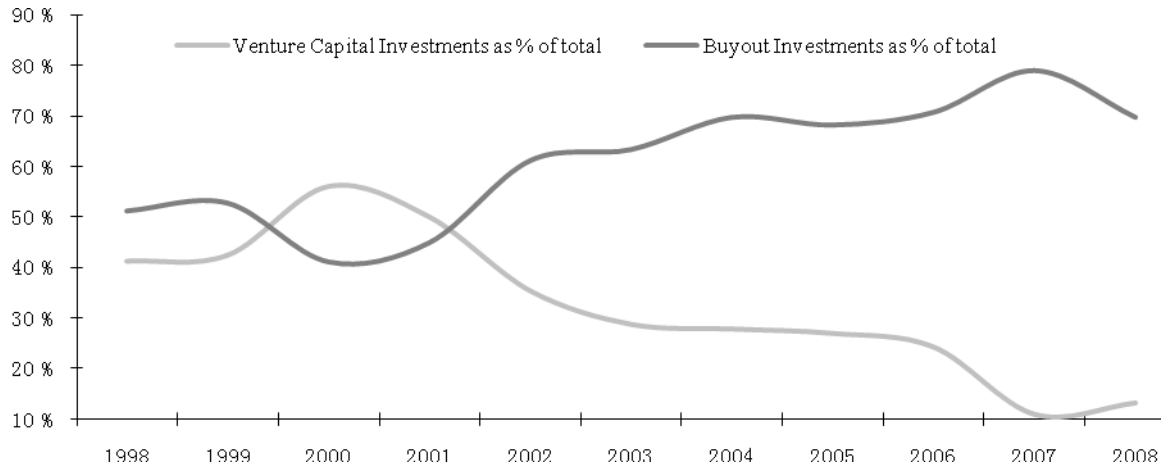

Figure 4. 4 The trend of venture capital investments and buyout investments as percent of total from 1998-2008. Source: EVCA Yearbook 2009

It seems that European capitalists are becoming more and more interested in later stages investments. In 2008, about 69.74% of the total amount was invested in buyout transactions. Growth stage investments and later stage venture investments followed with 13.74% and 7.91% respectively. And it is to a large extent because of the higher

return for later stage investments, which will be explained in detail in some chapter below.

This trend, however, is not very advantageous for the development of European's economy. Generally speaking, the ventures including seed, start-up and later stage venture help the establishment of new companies and contribute most to economic development. As most researchers recognize that the transformation of technologies from pure laboratory findings to regular business is the most difficult issue for entrepreneurs, venture capital firms help these people overcome that difficulty. In an economy where more VC funds are invested in the early stage, more technologies will go out of the lab which improves the average technological level of the economy; more new companies will be established and more people are employed. All these are beneficial for the economic development. However, the time horizon of investment is typically long for these types of investments. For example, seed investment in a pharmaceutical company may exceed 10 years before it becomes profits for venture capitalists. As a result, these venture capitalists have to put more efforts in nurturing these firms, causing the cost of investment too high and that may explain why VC investments in early stage are unpopular in Europe these days.

On the other hand, the investment in growth funds and buyout funds create less value. They involve investments in well-established companies which no longer grow rapidly and don't suffer from the threat of bankruptcies as much as start-ups. No new technologies are brought to the society after these transactions; no new firms are established except the change of companies' names and fewer workers are added to the new companies after transactions. Although the buyout fund may help companies reduce their operate cost through complicated mergers and acquisitions, thus increasing the efficiency of resources allocations in an economy, the total welfare improved under buyout will be smaller than those early stage ventures.

We can also interpret it from the law of diminishing marginal outputs. The production function is increasing and concave in the amount of capital invested. For start-ups, venture investment are highly productive, as these companies are normally in

shortage of capital; for well-established companies, the effect of venture capital investment on output increase is limited as there're already large sum of capital invested in these companies. As a result, the early stage venture investments are better than growth and buyout investment in terms of economic growth stimulation. This deduction can be partially verified by the empirical data provided in section 4.3 below.

Table 4. 3 Stage distribution of European VC investments, 2007-2008

Stages	**2007**		**2008**	
	Amount(€ thousands)	**%**	**Amount(€ thousands)**	**%**
Seed	184694	0.25%	310131	0.57%
Start-up	2453853	3.33%	2519316	4.65%
Later stage venture	5371905	7.28%	4283613	7.91%
Total venture	**8010452**	**10.86%**	**7113060**	**13.14%**
Growth	3979566	5.39%	7438001	13.74%
Rescue/Turnaround[3]	156772	0.21%	278162	0.51%
Replacement capital[4]	3374969	4.57%	1549733	2.86%
Buyout	58265802	78.96%	37749596	69.74%
Total investment	**73787561**	**100.00%**	**54128552**	**100.00%**

Source: EVCA Yearbook 2009

4.1.5 Sectoral distribution of investments

The sectoral distribution of European VC investments was quite a surprise as most funds didn't flow into high-tech industries. Life sciences and electronics only ranked the fourth and fifth with regard to the amount invested. And most capital was engaged to traditional industries such as consumer goods and services, business and

[3] Fianancing made available to an exitsting business which has experienced trading difficulties, with a view to re-establishing prosperity (EVCA).

4 Purchase of existing shares in a company from another private equity investment organisation or from another shareholder or shareholders (EVCA).

industrial products etc. This situation is closely related to the phenomenon discussed before that European VC investments are dominated by buyout funds. As there are more opportunities for mergers and acquisitions in traditional industries, they attract more funds than high-tech companies.

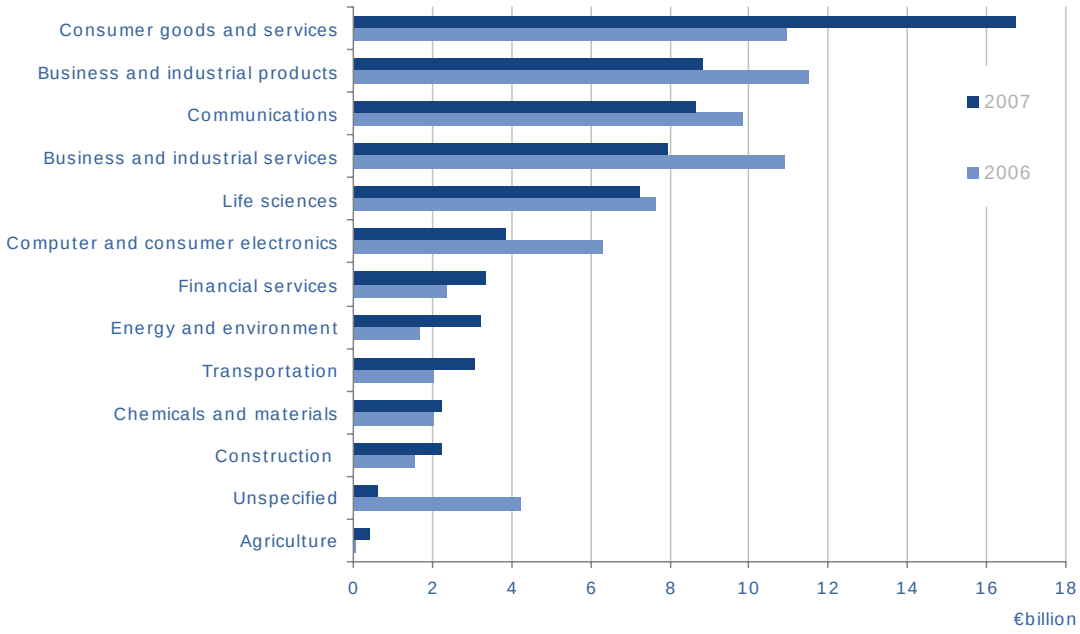

Figure 4. 5 Sectoral distribution of European VC investments, 2006-2007. Source: EVCA Yearbook 2008

4.1.6 Divestment by exit type

In 2007, about 27 billion euro exited the VC market in Europe. Trade sale, secondary sale and repayments of loans and shares were three most important exit routes for European venture capitalists in last five years. Although initial public offering (IPO) enjoys the fame of extraordinary rate of return, it has always not been the major route in the European market. On average, only 5% of VC investments can be exited through IPOs in last five years. IPO is probably the most ideal exit route for venture capitalists and also the most difficult one, at least in Europe.

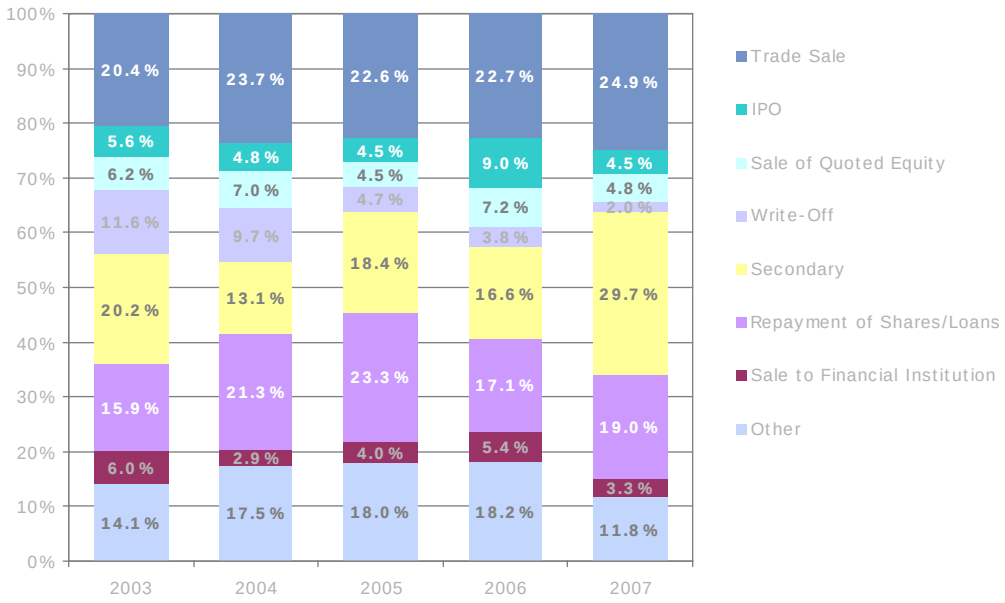

Figure 4. 6 Divestment activity in the European VC market, 2003-2007. Source: EVCA Yearbook 2008

4.1.7 Performance of VC funds

Table 4. 4 illustrates the net internal rate of return (IRR)[5] to different type of investors from 1980 to 2007. Obviously, the IRR of buyout investments is much higher than that of venture investments, which explains why European VC investors prefer buyouts. What's more, the net IRR was inversely related to VC fundraising and investment activities. The reason behind is that when IRR was high during 1990-1994, more capital was attracted and flew into the market which cause the decline of IRR in the next period. This kind of interaction is quite similar to the "cobweb model"[6] in economic theories.

Table 4. 4 Net IRR to investors by vintage year

Stage	1980-1984	1985-1989	1990-1994	1995-1999	2000-2004	2005-2007

5 The IRR is the interim net return earned by investors (Limited Partners), from the fund from inception to a stated date. The IRR is calculated as an annualised effective compounded rate of return using monthly cash flows to and from investors, together with the Residual Value as a terminal cash flow to investors. The IRR is therefore net, i.e. after deduction of all fees and carried interest. In cases of captive or semi-captive investment vehicles without fees or carried interest, the IRR is adjusted to created a synthetic net return using assumed fees and carried interest (EVCA).

6 As wikipedia explains, the cobweb model is an economic model that explains why prices might be subject to periodic fluctuations in certain types of markets. Nicholas Kaldor analyzed the model in 1934, coining the term 'cobweb theorem'.

Venture	6.5	8.1	8.7	4.3	-2	0.4
Buyouts	9.2	12.6	19.4	12.6	22	3.5
All VC	9.5	8.9	15.6	9.8	16.2	3.1

Source: EVCA Yearbook 2008

4.2 Legal and tax enviroments

In recent years, governments of European countries pay more and more attention to the importance of venture capital to economic growth. The European Union (EU) once claimed that venture capital is not only an essential element for promoting entrepreneurship and innovations, but also helps reduce the high unemployment rate problem in Europe. As a result, most countries in Europe are making efforts to providing better environments for the venture capital development.

EVCA makes surveys periodically to assess the legal and tax environment for venture capital in different European countries. The assessment is based on three dimensions: the environment for limited partners and fund management firms, the environment for venture-backed companies and the environment for researchers, entrepreneurs and managers etc. And EVCA designs a comprehensive index to reflect these environments. The better the environment is, the smaller the value will be. The survey of 2006 came up with the following result:

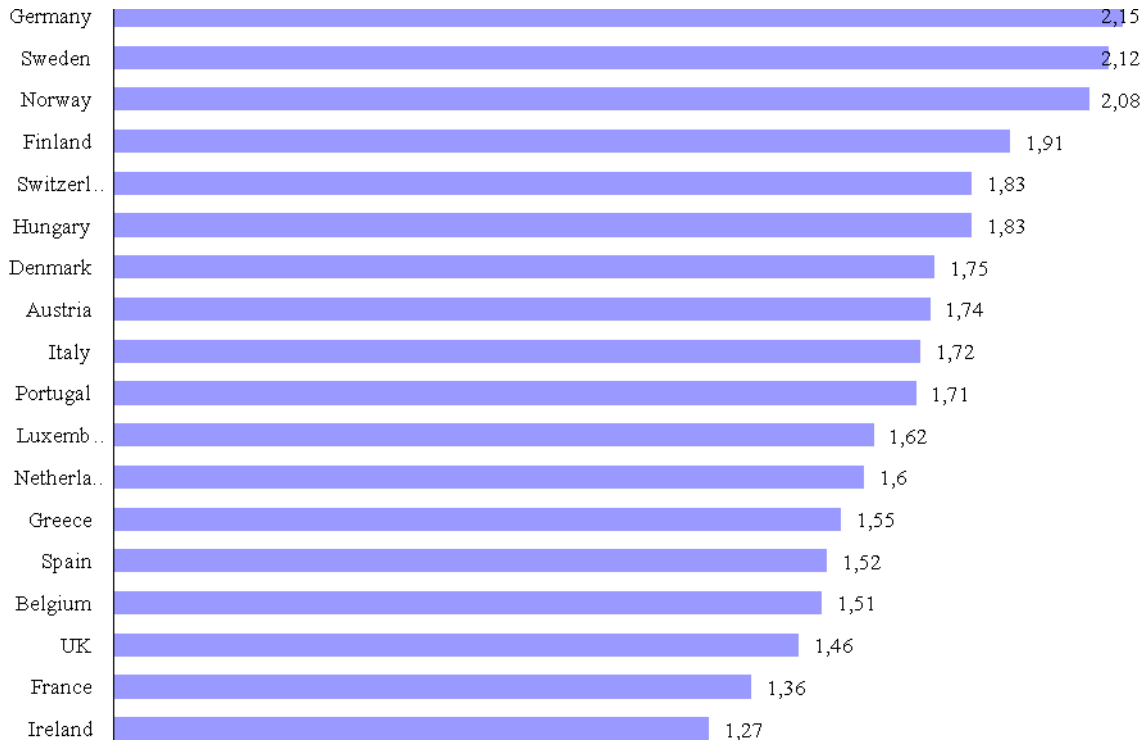

Figure 4. 7 Scores of venture capital environments in European countries, 2006[7]. Source: EVCA, 2006

From the figure, we find that Ireland, France and UK have the most favourable environment for venture capital activities in Europe. As a result, these countries have well development venture capital markets, as Table 4. 1 and Table 4. 2 illustrate. The environments in German, Sweden and Norway, on the other side, are rather though, and the market is comparatively small.

4.3 The economic impact of VC acitvities on European economy

As section 1 says that researchers found the positive impact of venture capital investments on job creation and innovation, this chapter will check out whether these effects really exist in Europe in recent years.

[7] The figure doesn't include scores for central and eastern europe.

4.3.1 Job creations

According to the survey conducted by EVCA in 2005, the number of employees in European venture and private equity-backed firms was about 6 million in 2004, about 3% of the total effective European labor force and about 25% the number of employees working in European major companies which compose Dow Jones STOXX 600 index.

From 2000 to 2004, venture and private equity-backed firms created one million job positions in sum with an annual growth rate of 5.4%, which is eight times the annual growth rate of total employment in the EU 25 member states (EVCA, 2005). During the same period, the number of employees in Dow Jones STOXX 600 companies decreased 0.1% annually.

Among the one million positions created, about 420 thousands were offered by buyout-financed companies. From the experience of America, mergers and acquisitions always accompany with large scales of dismissal. However, it is not the case in Europe. From 1997 to 2004, employment in buyout-financed companies increased at an average annual growth rate of 2.4%, four times the annual growth rate of total employment in the EU 25 member states.

The rest 630 thousands were created by venture-backed (including business angel-backed) firms. And the average annual employment growth rate in venture-backed firms was extraordinarily high, which was 30.5% between 1997 and 2004, almost 40 times the rate of EU 25 member states. It proves that early stage investments create more jobs that later-stage venture investments.

Figure 4. 8 illustrates the difference in job creation capabilities of different type of companies. The employment growth rate in venture and buyout-financed firms is substantially greater than that of the European average and STOXX 600 index companies, fully reflecting the important contribution that venture capital made to the European economy regarding to job creation.

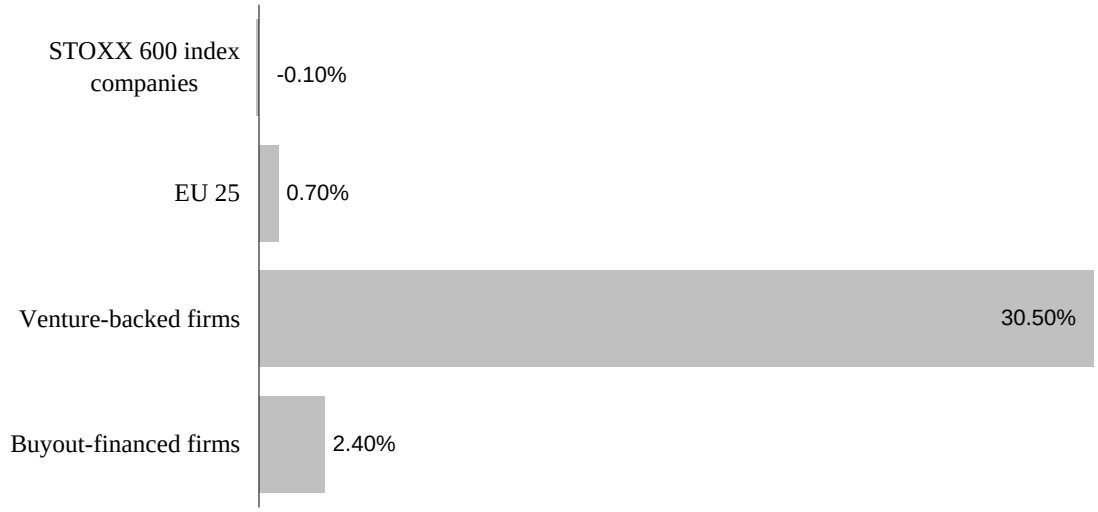

Figure 4. 8 Annual employment growth rate by type, 1997-2004. Source: EVCA, 2005

4.3.2 Innovation stimulation

The venture capital investments boost innovation activities because a large amount of fund flows into companies in their early or later-stage of development. And these companies show a great appetite for research and development. According to a survey conduct by EVCA in 2005, around 33% of employees in venture-backed companies work in R&D departments, 13% of which hold PhD degrees. The research expenses these companies spent every year account for 45% of their total expenditure and about 85% of their sales. And the annual average R&D expenses per employee in venture-backed firms was 50700 euro, which is 5 times more than the average of European 500 companies with the largest R&D spending (EVCA, 2005).

Besides, venture-backed companies also have a larger amount of granted patents than traditional companies. As the same survey by EVCA reports that there are on average 14 patent applications from a European venture-backed company every year, and among them 8 were granted. In these companies, every 12 people own a patent. As a comparison, about 10 thousands people have one patent on average in EU 25.

Figure 4. 9 shows the positive correlation between the number of high-tech companies and venture capital investments in Europe. The dataset includes 17

European countries and the time span is between 2002 and 2007[8]. The x-axis describes the number of high-tech companies; the y-axis measures the venture capital investment intensity, which equals to the value of VC investments divided by GDP in a given country. Therefore, each data point represents the combination of the number of high-tech companies and the VC intensity in country i and year t. Then we find the positive correlation between the venture capital investment intensity and the number of high-tech companies, because venture capitalists tend to invest in regions with sufficient high-tech resources. And then these investments will in turn lead to more innovation activities by help financing high-tech companies, which forms a virtuous circle of venture capital investments.

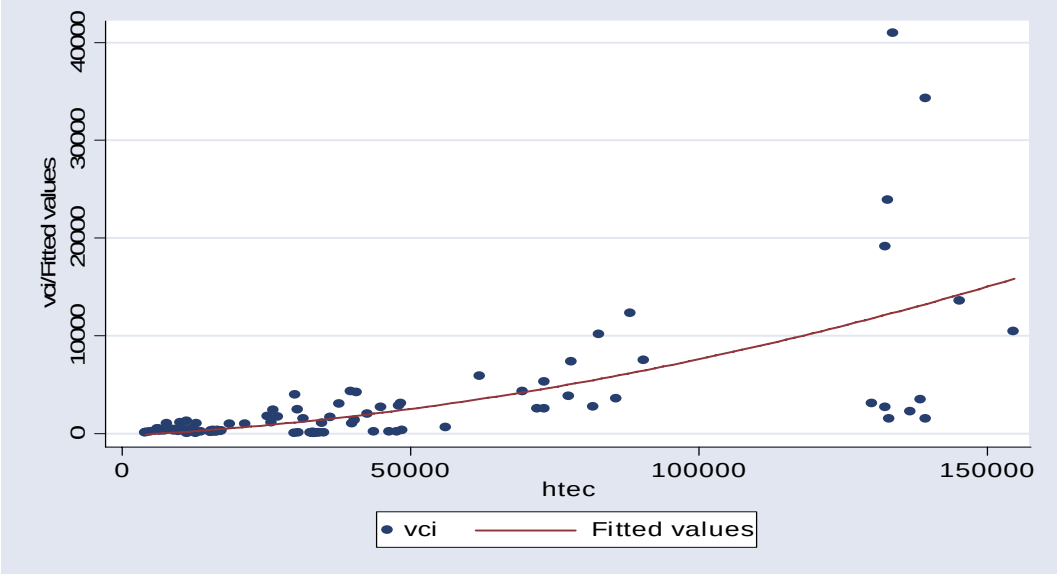

Figure 4. 9 The relationship between European high-tech company numbers and venture capital investments. Source: EVCA, Eurostat

In sum, the venture capital (including buyout funds and venture funds) did do a great contribution to job creations and innovation activities in Europe in recent years. The employment growth rate in venture-backed firms is much higher than that of the EU 25 member states. And the innovation activities in companies with venture investments are more active than those without. What's more, the earlier stage the

[8] Because of the availablility problem of data seriels, countries and time span included in analysis may change from time to time. In this particular situiation, the countries used including Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Netherlands, Norway, Poland, Portugal, Spain, Sweden and UK.

investment is in, the greater the contribution will be. These two empirical results confirm the theoretical findings of Dirk Engel (2004) and Josh Lerner (2000) etc. in Section 1.

5. What determines venture capital investments: the model

The survey of venture capital activities in Europe saw great gaps in the development of venture capital markets in different countries. Some are well developed but others are comparatively small. Section 4.2 have discussed that the difference in tax and legal environments may explain these gaps to some extent. In this section, I present econometric specification about how to derive the equilibrium amount of VC investments in a given country.

5.1 The basic model

Following the approach of Romain and van Pottelsberghe (2003), the equilibruim amount of VC investments is determined by both the supply side and the demand side of the venture capital. Assuming a situation where venture capitalists provide an amount of capital, k ,for companies in exchange for a share, α ,of the profit earned by investees. Then venture capitalists will choose a level of investment amount that maximizes the following profit function:

$$\max_{k} : \alpha p(a) f(k) - rk \tag{1}$$

α is the proportion of profits that investees must share with venture capitalist, reflecting the price of venture capital funds. As venture capitalists usually not only provide capital for companies, but also offer various managerial advices and services, they can help their portfolio companies increase production efficiency. $p(a)$ judges the effect of venture capitalists on the productivity of investees, a represents the services offered by venture capitalists. $f(k)$ is the production function of portfolio companies and is increasing and concave, i.e. $f'(k) > 0$ and $f''(k) < 0$. rk represents the opportunity cost of venture capital investment, namely the profit that can be earned if this amount of capital was invested in other projects. Thus r is the required rate of return for VC investments and can be measured by the interest rate for simplicity.

The first order condition of equation (1) gives the following result:

$$\alpha p(a) f^{'}(k) = r \quad \text{Or} \tag{2}$$

$$f^{'}(k) = \frac{r}{\alpha p(a)} \tag{3}$$

If r increases, $f^{'}(k)$ increases, because $f(k)$ is concave, k will decrease. If α increases, $f^{'}(k)$ decreases and k will increase. As a result, the supply of venture capital funds is positively related to the price of funds and negatively related to the interest rate.

Then the supply function of venture capital can be written as follows:

$$VC^{s} = a_0 + a_1 P + a_2 r \tag{4}$$

VC^{s} is the supply of venture capital funds, P is the price of venture capital. It is implied that $a_1 > 0$ and $a_2 < 0$. If we do a little rearrangement of the equation, we can get exactly the same supply function provided by Romain and van Pottelsberghe (2003)

On the other side, the demand function of VC investments by Romain and van Pottelsberghe (2003) should be extended to include the impact of the capital market as follows:

$$VC^{d} = b_0 + b_1 P + b_2 Y + b_3 MCAP + b_4 TO + b_5 EN + b_6 r \tag{5}$$

It is assumed that $b_1 < 0$, because the increase in the price of venture capital will decrease the demand of VC investment. b_2, b_4 and b_5 are all greater than zero, because a high GDP growth rate (Y), a greater number of technology opportunities (TO) and a better entrepreneurial environment all boost the demand of VC investments. b_6 is also greater than zero, as when the interest rate is raised, more companies tends to finance from venture capitalists, rather than from banks. The depth of the capital market matters ($MCAP$) matters because it influences the price of a company's equities when they are sold to venture capitalists. If the capital market is

deep enough, the value of a company should be fully discovered by the market, thus entrepreneurs are willing to sell part of their shares to venture capitalists. As a result, a deeper capital market will boost VC demands, i.e. $b_3 > 0$.

It's worthwile to discuss how venture capital investment activities are related to the GDP growth rate. As the last section illustrates, VC investments are able to create jobs in an economy entity and thus reducing the unemployment rate which will stimulate the economic growth rate in the short run.

To understand the impact of venture capital investments on GDP growth rate in the long run, let's consider the Schumpeterian approach to endogenous growth discussed by Barro & Sala-i-Martin (2003). It has long been recognized that the economic growth rate depends on the technological progress. Schumpeter internalized the technological progress through the "process of creative destruction", focusing on how knowledge is created and used. The main idea is that innovations improve the quality of products and driven out low quality products. As a result, company who undertakes research activities in this period has a probability to earn some monopoly interests in the next period. The length of being a monopolist is random, until the next innovation occurs. And I'll argue that VC investments may speedup the progress of technological improvement in an economy, thus increasing the economic growth rate.

According to Jon Vislie (2009), the Schumpeterian approach gives out the steady-state equilibrium number of labor in the research sector as follows:

$$\hat{n} = n(g, L, a, r, \lambda) = \frac{g\,\frac{1-a}{a}L - \frac{r}{\lambda}}{1 + g\,\frac{1-a}{a}} \tag{6}$$

Where n represents the number of workers in the research sector; g is the improvement of products' quality; L is the total skilled labor; a represents the elasticity of demand; r is the discount rate that judges the present value of future monopoly profit and λ judges the productivity of research technology.

Assume that the number of workers in the research sector is increased, the level of technological progress will be higher, and thus the expected growth rate will be bigger in this economy. Then VC investments stimulate the economic growth rate through at least following two channels:

First, with the help of venture capitalists' expertise, a venture-backed firm becomes more fruitful in R&D. Thus the general productivity of research technology in an economy improved and λ increased. From equation (6), an increase in λ will increase the number of worker in R&D sector and the economic growth rate will be higher. Second, venture capital investments also help increase the size of innovation undertook by investees. Then g is larger, which increases the monopoly profit in the next period. And the equilibrium number of labor in the research sector will be larger and economic growth rate increased.

Thus the relationship between VC investments and GDP growth rate should be greater than zero, namely $b_2 > 0$. Combining equation (4) with equation (5) together, we can get the equilibrium amount of VC investments in an economy:

$$VC = \frac{a_1 b_0 - a_0 b_1}{a_1 - b_1} + \frac{a_1 b_2}{a_1 - b_1} Y + \frac{a_1 b_3}{a_1 - b_1} MCAP + \frac{a_1 b_4}{a_1 - b_1} TO + \frac{a_1 b_5}{a_1 - b_1} EN + \frac{a_1 b_6 - a_2 b_1}{a_1 - b_1} r \qquad (7)$$

As $a_1 > 0$, $b_1 < 0$, b_2, b_3, b_4 and b_5 are all greater than zero, we can expect that GDP growth rate, the depth of the capital market, the technology opportunities and entrepreneurial environment are positively related to the amount of venture capital investments. The effect of interest rate on VC investments is ambiguous, which depends on the value $a_1 b_6$ and $a_2 b_1$. If $a_1 b_6 > a_2 b_1$, then the sign is positive; negative otherwise.

5.2 The extended model: how does legal environment matter?

The analysis of Romain and van Pottelsberghe (2003) is concentrated in the slope of the function, namely how much more venture capital will be invested if the GDP

growth rate increases by one percent, etc. Other focuses their studies on the intercept of VC investment function, namely the $\frac{a_1 b_0 - a_0 b_1}{a_1 - b_1}$ part. They are actually trying to answer this question: given all variables equal, what cause the differences in the VC investment amounts in different countries. The explanation goes to the differences in the legal environment of different countries. Pukthuanthong et al. (2007) make an empirical test on 19 Europe countries over the period 1994-2004 and find that countries with independent legal system tend to have larger amounts of VC investments; countries with a flexible, dynamic legal system also have active venture capital investment activities.

In this paper, however, I'll argue that the legal environment does not only affect the intercept of VC investment function, but also the slope of it. Because the legal environment won't be changed dramatically in the short run, let's use the index provided by EVCA (2006) to describe the comprehensive legal environment over the period 2002-2008 in European countries. And then focus on the interaction of the legal index with other variables.

We can assume that the legal environment will influence the effect of public research and development expenses (public R&D) on VC investments. That is to say, the impact of public R&D on VC investments is composed of a fixed component effect and a component that varies across countries according to the level of legal environments. It is rational because the public investment in R&D will produce more technology opportunities in countries with favorable legal environments, thus the total amount of VC investments in that country will also be higher.

Besides, I'll also consider whether the type of legal system matters in the determination of VC investment. Following Pukthuanthong et al. (2007), I'll use the dummy variable, CL, to define the type of legal system in a country. CL equals to one when a country adopts the case law tradition and zero otherwise. Generally speaking, a case law system is more flexible and adapts more easily to changing economics and financial circumstances (Pukthuanthong et al., 2007). As a result we should expect that countries with case law will have greater VC investments than those without.

Again, I will present the effect of the type of legal system on the VC investment by interacting with public R&D.

Then the econometric model turns out to be the following equation:

$$VC_{i,t} = c_0 + c_1 \Delta GDP_{i,t} + c_2 MCAP_{i,t} + c_2 i_{i,t} + c_3 RDP_{i,t} + c_4 EPL_i * \Delta GDP_{i,t} + c_5 LT_i * RDP_{i,t} + c_6 CL_i * RDP_{i,t} + \varepsilon_{i,t} \quad (7)$$

Where ΔGDP reflects the GDP growth rate. $MCAP$ reflects the depth of the capital market. i is the interest rate. RDP represents the public investments in R&D. EPL measures labor market rigidities, which will be explained in the next section. LT reflects the legal environment in different countries and CL indicates whether the country follows the case law tradition.

6. What determines venture capital investments: empricial evidence from the Europe

Last section produces the econometric model for the equilibrium amount of VC investments. In this part, I'll do an empirical test on 15 European countries over the period 2002-2008 using that model. The software used to do regression analysis is STATA 8. Let's begin with the construction of dependent and independent variables.

6.1 Dependent and independent variables

I'll use venture capital intensity (VCI) as the dependent variables, which makes the value of different countries comparable. VCI represents the average venture capital investment amount in a country divided by the country's average GDP during the same period, i.e. VCI equals to VC investmnets/GDP. The values of VC investments are derived from EVCA, and GDP are derived from the European Statistic Bureau.

The independent variables are divided into four categories. The first are factors that reflect economic conditions. It includes economic growth rate (ΔGDP), depth of the capital market ($MCAP$) and long term interest rate (i). ΔGDP is calculated by dividing the nominal GDP of year t by that of year $t-1$, and then minus 1 to reflect the growth rate of the GDP. The depth of a country's capital market are calculated by dividing the total value of equities traded in the country's stock exchange to the average GDP of that country. The total value of equities traded in a country's stock exchange is provided by the European Statistic Bureau. The long term interest rates are derived from the yields of government bond with 10 years' maturity, which is also provided by the European Statistic Bureau.

The second is the factor that reflects technology opportunities. Gompers and Lerner (1998) prove that R&D expenses in industrial companies are highly related to VC investments in a country. In my analysis, I'll use the public R&D expenses (RDP) to reflect technology opportunities. The consideration of using public R&D expenses rather than R&D expenses in private sector is inspired by Margaret M. Blair's

comments on Gompers and Lerner's paper referred above. The original comments are:

"The authors have found that their R&D spending variables, in their state-level regressions, are highly significant predictors of-and prob-ably causally related to-venture capital activity. Such variables are manipulable by government policy and should be considered part of the arsenal of policy tools available to policymakers to stimulate venture capital activity. More research on this relationship is probably war-ranted."

To figure out the exact effect of government R&D policies on the activity of venture capital investments, running an empirical test with the public R&D expenditure variables may provide an explicit answer. And the result may also be instructive for governments who want to use public R&D as a policy tool to stimulate venture capital activity.

The third is the entrepreneurial environment proxy. Following the approach of Romain and van Pottelsberghe (2003) and Bonini and Alkan (2009), I'll use the labor market rigidity index (EPL) offered by OECD (2000) to judge the entrepreneurial environment. OECD originally produces the index to reflect the employment protection levels in different countries. It takes on values from 0 to 6, with 6 representing the highest level of employment protection. It can be used to measure the labor market rigidity because high level of protection will cause layoffs difficult, thus increasing the labor market rigidity. And the entrepreneurial environment in a country with high labor market rigidity is usually tough. So we can expect that EPL will have a negative impact on VC investment activities.

The last are legal environment variables LT and CL, which have already been defined in the last section. The variable LT takes on values from 0 to 3, with 0 representing the best legal environments for venture capital activities. As a result, we should expect that LT will have a negative effective on VC investments. And the dummy variable CL should be positively impact the amount of VC investments.

Table 6. 1 Summary of variables

Variables	**Description**	**Sources**	**Expected Sign**
VCI	Venture capital intensity in a given country, which equals to VC investmnet / GDP.	EVCA (2002-2009)	
Independent variables			
Econonmic variables			
ΔGDP	Economic growth rate, which equals to $\frac{GDP_t}{GDP_{t-1}} - 1$	Eurostat.	+
MCAP	Total value of equities traded in the stock exchange as a percentage of GDP.	Eurostat.	+
i	Yields on the government bond with 10 years' maturity	Eurostat.	
Technology opportunities			
RDP	The amount of public R&D expenditures in the log ratio form.	Eurostat.	+
Entrepreneurial environment			
EPL	The labor market rigidity index ranging from 0 to 6, with 6 representing the highest level of market rigidities.	OECD (2000)	–
Legal environment			
LT	The comprehensive legal environment index for European countries, ranging from 0 to 3, with 0 representing the best legal environment for venture capital activities.	EVCA (2005)	-
CL	A dummy variable that equals to 1 if judges base their decision on case law and 0 otherwise. It's generally recognized that countries with case law have higher levels of financial development.	Pukthuanthong et al. (2007)	+

6.2 Data description

The dataset contains 15 European countries over the period 2002-2008. These countries are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

The using of panel data has several advantages over cross-sectional and time series data. First, the estimated coefficient will be more accurate because panel data contains the information from both cross-sectional and time series data which lead to higher degrees of freedom and a larger number of observations in the dataset. Second, for fixed-effect regressions, the panel dataset can infer consistent or even effective estimate of parameters. Third, because the panel data is the repeated observation of the same cross section during the time period, it provides more details about the dynamics of economic relationships. As both the time span (seven years) and the number of countries (15 countries) under consideration here are not bigger enough for a well performed regression, using the panel dataset will solve this problem and provide a more robust estimate of parameters.

The following table summarizes the dataset. The value of venture capital intensity, GDP growth rate, total stock market value and public R&D expenses are the average of the amount between 2002 and 2008, in million Euros.

Table 6. 2 Summary statistics for the dataset of 15 European countries over the period 2002-2008[9]

	VC intensity	GDP	Total Value of Stocks Traded	Public R&D	EPL	LT	CL
Austria	0.000679	246761.2	87342.9	39.4	2.11	1.74	0
Belgium	0.001686	305065.6	201196.0	43.2	2.78	1.51	0
Denmark	0.002815	208068.5	93826.7	55.2	2.46	1.75	1

[9] The values of EPL come from OECD (1994a), the values of CL are derived from Pukthuanthong et al. (2007). All other variable values come from the European Statistic Bureau and authors' calculation.

Finland	0.0027	161110.0	134496.7	98.8	2.68	1.91	1
France	0.004341	1740112.9	1296500.0	97.1	2.63	1.36	0
Germany	0.001806	2287025.7	986722.9	96.8	1.76	2.15	0
Greece	0.000575	198037.5	109791.4	21.1	3.87	1.55	0
Italy	0.001728	1435856.4	584248.6	45.5	3.92	1.72	0
Netherlands	0.004037	521644.7	591210.0	75.2	2.28	1.6	0
Norway	0.001882	245056.0	138218.6	130.5	3.19	2.08	1
Portugal	0.001221	150314.3	79020.0	17.3	2.83	1.71	1
Spain	0.002251	912497.9	777107.1	41.2	2.59	1.52	0
Sweden	0.008802	299278.3	226046.7	52.8	1.51	2.12	1
Switzerland	0.001905	306587.4	714100.0	11.5	2.08	1.83	1
UK	0.012601	1824543.9	2176904.3	51.9	0.55	1.46	1

Source: EVCA, Eurostat, OECD (2000) and Pukthuanthong et al. (2007).

6.3 Empirical results

Besides all those explanatory variables I've included in the regression model, there are some unobservable factors like regional culture, investment atmosphere etc. which vary across countries causing the different level of venture capital investments in different countries. At the same time, these factors are influenced by the different value of explanatory variables. For example, when the GDP growth rate is increased, the expected profit of investment will be higher and the general investment atmosphere will be improved. As a result, I'll choose the fixed effect regressions using the within estimator to capture all those unobservable country-specific factors. The empirical analysis starts with the estimation of VC intensity on each single independent variable listed in the equation (7). Table 6. 3 illustrate the estimation

results. The GDP growth rate, depth of the capital market and public R&D expenditures are positively related to VC intensity which exactly fit our model and the coefficients are significant. The long term interest rate is negatively related to VC intensity, suggesting the supply effect of interest rates is stronger than the demand effect, i.e. $a_1 b_6 < a_2 b_1$ in equation (6). It's rational because entrepreneurs should have a shorter vision of financial constraints than fund providers (Romain and van Pottelsberghe, 2003).

Table 6. 3 Estimation results of the VC intensity, single independent variables

Dependent variable: VC intensity (VC / GDP)					
		OLS	OLS	OLS	OLS
Regressions		1	2	3	4
Econonmic variables					
GDP growth rate	ΔGDP	0.0148**			
		(2.07)			
Depth of the capital market	*MCAP*		0.0025**		
			(2.60)		
Long term interest rate	*i*			-0.00115**	
				(-2.25)	
Technology opportunities					
Public R&D expenditures	*RDP*				0.0033**
					(2.42)
Control variables					
Country-specific intercept		YES	YES	YES	YES
Adjusted R-squared		0.19	0.096	0.54	0.04

Notes: * indicates that the parameter is significant at 10% probability threshold; ** indicates 5% probability threshold and *** indicates 1% probability threshold.

Then we run the analysis that includes all potential explanatory variables. Column 1 includes the effect of both the comprehensive legal environment and the type of legal systems. Column 2 considers the effect of comprehensive legal environment only and Column 3 considers the effect of the type of legal systems only. All signs of coefficients are in line with our expectation, and most of them are significant at 10% probability threshold.

Table 6. 4 Estimation results of the VC intensity, complete model and take the legal environment into consideration

Dependent variable: VC intensity (VC / GDP)				
		OLS	OLS	OLS
Regressions		1	2	3
Econonmic variables				
GDP growth rate	$\Delta GDP_{i,t}$	0.040**	0.062***	0.040**
		(2.10)	(2.83)	(2.06)
Depth of the capital market	$MCAP_{i,t}$	0.012***	0.014***	0.013***
		(4.31)	(4.24)	(4.54)
Long term interest rate	$i_{i,t}$	0.001*	0.001**	0.001*
		(1.8)	(2.05)	(1.92)
Technology opportunities				
Public R&D expenditures	$RDP_{i,t}$	0.023	0.011	-0.009***
		(1.1)	(0.51)	(-2.81)
Entrepreneurial environment				
Labor market rigidity	$EPL_i * \Delta GDP_{i,t}$	-0.018*	-0.027***	-0.020**
		(-1.68)	(-2.22)	(-1.94)
Legal environment				
Comprehensive legal environment for venture	$LT_i * RDP_{i,t}$	-0.020*	-0.013	
		(-1.66)	(-0.9)	

capital activity				
Type of the legal system	$CL_i * RDP_{i,t}$	0.032***		0.030***
		(3.96)		(3.66)
Control variables				
Country-specific intercept		YES	YES	YES
Adjusted R-squared		0.6684	0.096	0.54

Notes: * indicates that the parameter is significant at 10% probability threshold; ** indicates 5% probability threshold and *** indicates 1% probability threshold.

Now we can analysis the influence of legal environments on the effectiveness of government policies. If a government wants to stimulate venture capital activities in its country by making more investment in public R&D expenses, it should be aware that the legal environment may influence the effectiveness of its policy. Equation (1) shows that the coefficient of the comprehensive legal environment variable is negative. This implies that the increase in the value of comprehensive legal environment index will decrease the effect of public R&D on VC investments. As a high value of the legal environment index represents a worse legal environment for VC activities. The previous implication is equivalent to that a worse legal environment will diminish the effectiveness of public R&D investments as a policy tool.

Let’s consider how the market equilibrium is achieved:

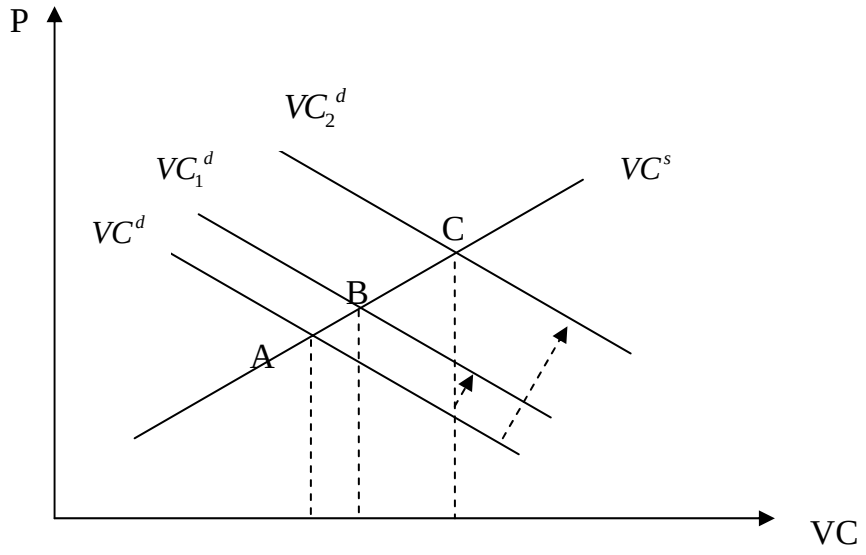

Figure 6. 1 The impact of legal environment on the equilibrium VC investments. Source: Author's construction

In the figure, the x-axis represents the amount of VC investments; the y-axis represents the price of VC funds. VC^s is the supply curve of VC investments defined by equation (4) and VC^d is the demand function of VC investment defined by equation (5). Assuming there are two countries that both decide to make more investments in the public R&D to boost the VC activities in their counties, and country 2 has a better legal environment than country 1. Then the demand curve of country 2 will shift upward to VC_2^d. And the demand curve of country 2 will shift upward to VC_1^d, which is lower than VC_2^d because a worse legal environment diminish the stimulation policy. As a result, in the new equilibrium, the VC investments amount in the country with a good legal environment will be larger than the country with a bad one.

6.4 Summary

My regression results confirm the previous researches by Gompers and Lerner (1998), Jeng and Wells (2000), Romain and van Pottelsberghe (2003) and Bonini and Alkan (2009). The venture capital investment is positively related to the GDP growth rate, depth of the capital market, entrepreneurial environments and public R&D

expenditures. What's more, I add the legal environment into the demand function of VC investment and find that a bad legal environment will diminish the effectiveness of government policies. Points that are instructive to the government can be concluded as follows:

1. The amount of venture capital investments is positively related to the economic growth rate. Countries with rapid growth rate can expect to see the rapid development of VC activities.

2. The amount of venture capital investments is positively related to the depth of a country's capital market. Serving as an important exit route, the depth and liquidity of a capital market determine the attractiveness of a country to venture capitalists. The historical development of European venture capital market also proves it, as the total VC investments boomed since the opening of Euro new market in 1996. Governments who want to boom the venture capital investments should establish a well-developed capital market.

3. The entrepreneurial environment also matters in venture capital activities. For countries with higher rigidities in the labor market, the total amount of VC investments will be smaller. As a result, countries make a balance between the protection of employment and the development of VC markets. Too much protection will decrease venture capital activities and to less protection may cause other social problems.

4. Public R&D spending can be used as a policy tool by governments to boost venture capital activities. However a bad legal environment will diminish the effectiveness of the policy. As a result, the government should not only make more public R&D investments, but also try to improve the legal environment for venture capital activities. And generally, in countries with case law tradition, the effectiveness of their stimulation policies on VC investments will be greater.

7. The venture capital market in China

7.1 Recent developments in Chinese VC market: a comparison with the Europe

As Chinese official statistics has not covered the activity in the venture capital market, nor does China has authorized venture capital association like EVCA. The dataset used in this paper comes from the CVSource database provided by ChinaVenture Investment Consulting Group, a leading private equity information provider in China.

7.1.1 Fundraising activity

According to ChinaVenture (2010), the total amount raised by the venture capital firms in China arrived at 19.9 billion US dollars and 12.33 billion US dollars in 2008 and 2009. Compared with the 78.7 billion euro raised in Europe in 2008[10], the capital raised in China was only 17.5% the amount of Europe, assuming that one euro equalled 1.4 dollars at that time. So from the perspective of total fundraising amount, the venture capital market in china is still quite small and on its early stage of development.

[10] Because I haven't got the European data for 2009 (maybe haven't been published). All comparison will be based on 2008's value in this Section.

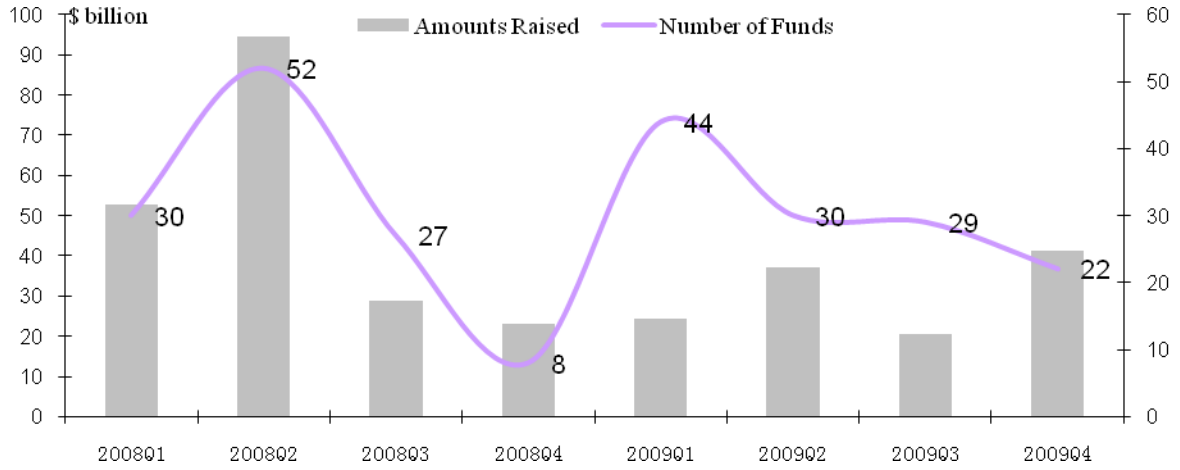

Figure 7. 1 The fundraising amounts in China, 2008-2009. Source: CVSource

Among the 12.3 billion US dollar raised in 2009, about 58% was provided by Chinese local institutional investors which are major players in the market. Another 31% was provided by foreign investors. And the rest 11% was offered by Sino-foreign joint ventures. The diversification of fund sources is much similar to the situation in Europe, reflecting the globalization trend of venture capital flows.

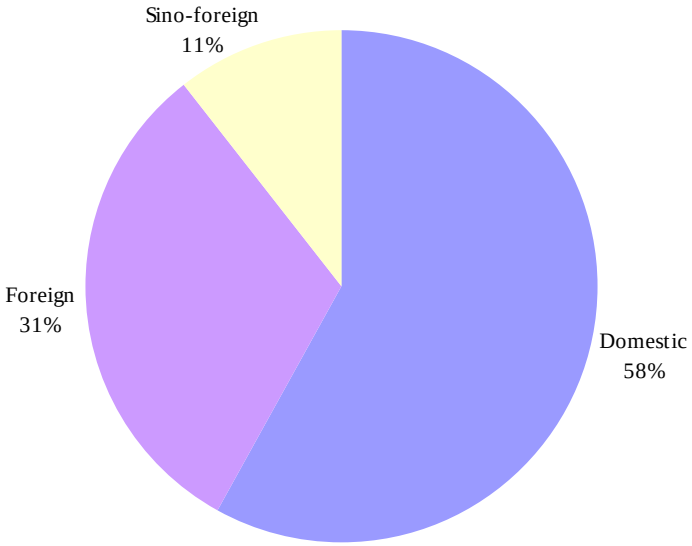

Figure 7. 2 Contribution of different sources to fundraising in China, 2009. Source: CVSource

7.1.2 Investment activity

Figure 7. 3 illustrates the historical trend of VC investment activities in china from 2006 to 2009. The total amount invested in 2009 is 22.4 billion US dollars, a 43.6% increase from the previous year. However, it is still a tiny number compared with the Europe. Take 2008 as an example, the investment amount in China was only 20% of the Europe.

Comparing it with Figure 4. 3, we find that the impact the Chinese VC industry suffered from the global financial crisis of 2008 was much smaller than the European VC industry did. The investment amount of Europe in 2008 decreased almost 37% from the previous year, while the amount in China only decreased 15.6% at the same time. The reason behind this is that the EU venture capital industry is more closely related to their US counterparts than China does. Many VC firms in Europe are affiliates of American VC companies and a large sum of capital flow from US investors to the EU venture market. When the financial crisis broke out in the United States, American investors became cautious about their investments in Europe and some even withdrew their fund back, all of which lead to the sharp decline of the venture capital activity in Europe.

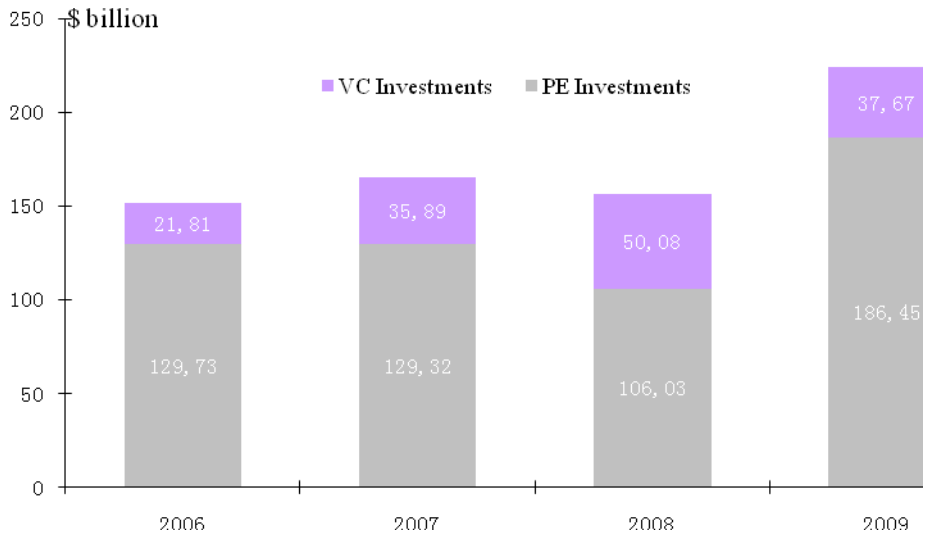

Figure 7. 3 Venture capital investments in China, 2006-2009. Source: CVSource

7.1.3 Stage distribution of investments

Despite that the total volume of the VC market in China is so much smaller than the Europe, the investments in early and later-stage ventures are however, quite comparable. In 2008, that part of investment was 5 billion US dollars in China, and 7.1 billion euro in Europe. Besides, the expansion speed of venture investments is much higher in China. Figure 7. 4 shows that the investment amount in early and later-stage ventures keeps increasing in China in recent years. The average annual growth rate between 2002 and 2008 is 45%, while at the same time the investment in early and later-stage ventures in Europe decreased by 16.9%.

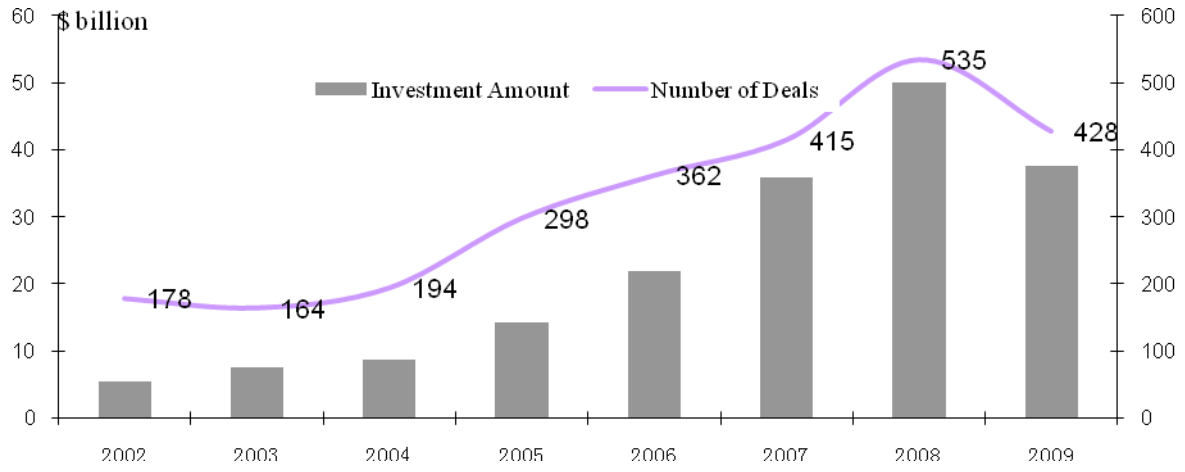

Figure 7. 4 Investment activities in early and later-stage ventures in China, 2002-2009. Source: CVSource

The percentage of fund invested in early and later-stage ventures in China is higher than that in Europe as well. In 2009, the venture investment accounted for 16.81% of the total investment. The figure of 2008 was even higher, which was 32.08% and much greater than the 13.14% of Europe. In section 4, the experience of Europe has shown that early stage investment will be more beneficial to job creations and innovations. Therefore, a higher percentage of early stage investments will make greater contributions to the Chinese economy.

Table 7. 1 Chinese VC investments by stage, 2009

Stage	Amount ($million)	% of Chinese total
Early Stage	89.43	0.40%
Development Stage	2452.94	10.95%
Expansion Stage	1005.08	4.48%
Profitability Stage	219.24	0.98%
Total Venture	**3766.69**	**16.81%**
Growth Capital	3032.68	13.53%
PIPE	14720.57	65.68%
Buyout	891.47	3.98%
Total Investment	**22411.41**	**100.00%**

Source: CVSource

Accordingly, the buyout market in China is too less active than that in Europe. The buyout market has always been the most important segment of the European venture capital market and investment in buyouts in 2007 and 2008 accounted for 78.96% and 69.74% of the total investments respectively. But it is not the case in China, as Table 7. 1错误！未找到引用源。 shows that the investments in M&As only occupied 3.98% of total investment. This phenomenon goes in line with the economic environment of China. Generally speaking, the establishments of new enterprises tend to be more frequent in an emerging economy than in developed countries, while the latter have more chances in the field of M&As.

Among all the investment stages, the private investment in public equity (PIPE) attracted the highest percentage of money. For companies, PIPE is an alternative method of financing to secondary offerings. But it's more time efficient because it has less regulatory issues with the Chinese Securities Regulatory Commission (CSRC). And because PIPE doesn't accept individual investments, it belongs to a

kind of private equity. The scale of PIPE In 2009 reaches 14.7 billion dollars in China, accounting for 65.68% of the total investments.

7.1.4 Sectoral distribution of investments

The industry selection of venture capital investments in China is also quite different than that of the Europe. Finance, Chain Store & Franchise and Energy are the top three industries that attracted most PE investments in 2009, while Internet, IT and Manufacturing are the top three industries that attracted most VC investments. And the VC/PE investments in Europe were clustered in the industry of consumer goods and services, commercial and industrial products and telecommunication. This is because the venture capital market is dominated by buyout funds. These funds usually invest in traditional sectors like consumer goods and services etc., because companies in these sectors have more chances of mergers and acquisitions. While in China, the private investment in public equity (PIPE) dominates the market. And this kind of funds usually invest in sectors with monopoly power, like the finance sector and the energy sector etc.. With regard to early stage ventures, both venture capitalists in China and those in Europe focus on high-tech industries like IT etc.

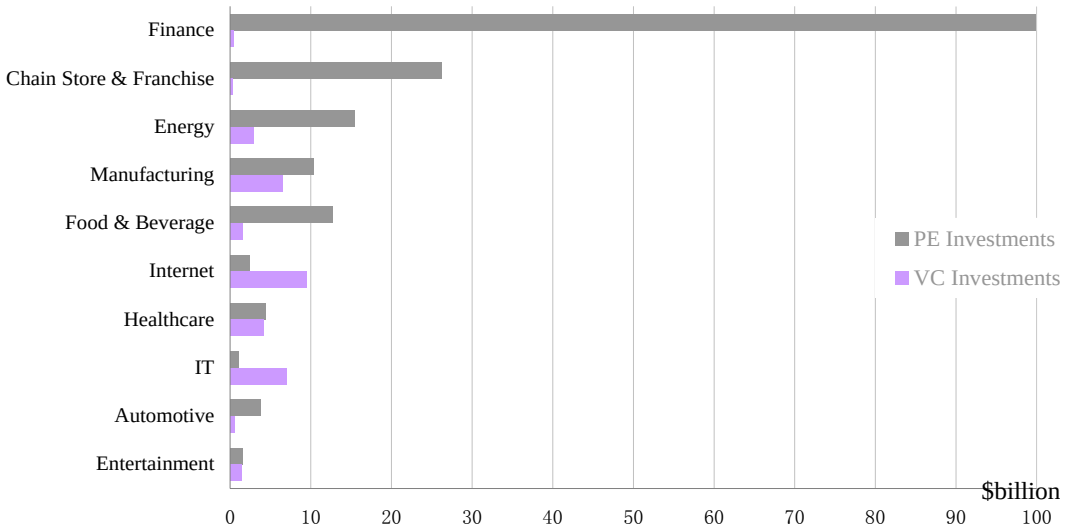

Figure 7. 5 Sectoral distribution of Chinese VC investment, 2009.
Source: CVSource

7.1.5 Exit activity

As there are no data about the sum of divestment in China, this chapter will use the financing activities of venture-backed firms to reflect the exit potentials for Chinese venture capital companies. Unlike the European market, IPO is the most commonly-used exit route for venture capitalists in China. According to CVSource database, 73 venture-backed enterprises finished initial public offerings in 2009 and the amount raised was 13.75 billion dollars. The number of IPOs increased by 356.3% and the amount of total capital raised increased by 214. 9% than the previous year. Comparatively, divestment through M&As is much less common in China. 2009 saw 16 VC-backed M&A transactions with a total amount of 4.37 US dollars.

The rate of return for IPO is extremely high and varies from time to time with substantial fluctuations. The average rate of return was 500% for all IPOs in 2007, and declined to 200% in 2008 because of the slump in the capital market. It kept running at a low level in the first three quarters of 2009, which was 150% but skyrocketed to 1490% in the last quarter of 2009. The substantial increase in the rate of return in the last quarter was closely related to the launch of the Chinese second board, which claimed to be the Chinese version of NASDAQ or Euro new market. Companies listed in the second board were valued at extremely high PE ratios (almost 100 on average, while PE ratios on the main board were only 25 at that time), creating a large sum of wealth to their venture capital investors. For example, the book return on investment (ROI) of ChinaEquity's investment in Huayi Brothers was 2160% when the latter went public in October 2009. ChinaEquity is a Chinese leading private merchant bank engaging in VC and PE and Huayi Brothers is the largest private film production company in China. The investment of Shenzhen Capital Group Co., Ltd., the largest venture capital investment institution in China, in the ChinaNetCenter also achieved 21.27 times return of their original investments. The highest book ROI belongs to Drehmo's investment in Qingdao Tgood Electric Co., Ltd, which reached 225.10 times. The launching of the Chinese second board has to a large extent facilitated the flotation of SMEs' equity and it can be predicted that

the high ROI will attract more and more fund to flow into the venture capital market in the following years.

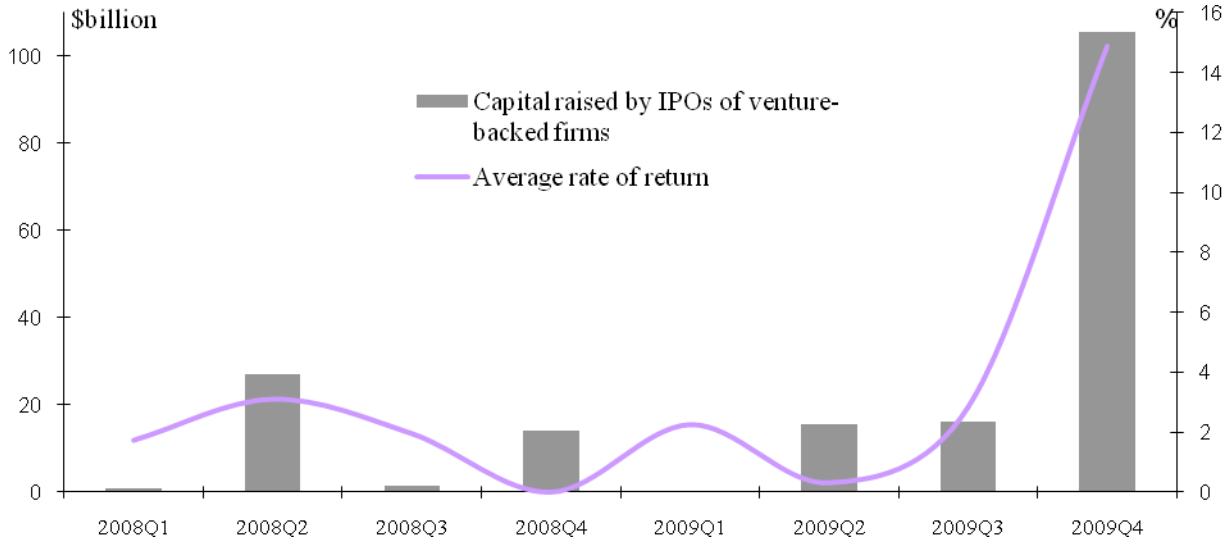

Figure 7. 6 The capital raised by IPOs of venture-backed firms and the average rate of return for venture investors, 2008-2009. Source: CVSource

Comparing to the venture capital market in Europe, the exit routes in China is quite scarce. There are over 7 kinds of exit routes for European venture capitalists including trade sale, secondary sale and repayments of loans and shares etc. But in china, only IPOs play important roles for venture capital divestments. It happens because the transfer of equity relies not only on a well-developed stock market but also on other kinds of capital markets, especially the over-the-counter market (OTC). As the stock market is relatively mature in China with sufficient regulations, IPOs become the most reliable routes for the transfer of equities. But for other markets, they are still on their early stage of development and in lack of related regulations, thus venture capital investments in China are difficult to exit through other methods undertook in Europe. It is therefore urgent for Chinese government to establish a well-developed multi-level capital market in order to boost domestic venture capital activities.

7.2 The imbalanced regional development of venture capital in China

Just like the situation in Europe, the development of venture capital in different provinces of China also presents great discrepancies. Take year 2009 for example, the venture capital investment was heavily concentrated in the eastern part[11] of China because of the well developed financial services industry and a relative wealthy economic environment in that region. The second went to the western part of China due to the large storage of energy resources in that place. As energy prices skyrocketed in recent years, investment in energy resources is extremely hot in today's China. The middle part of China attracted the least amount of venture capital investments.

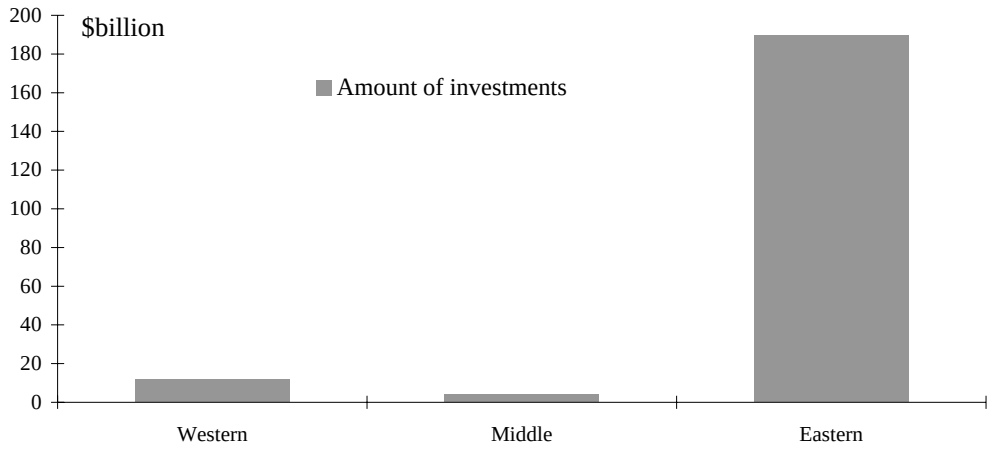

Figure 7. 7 Regional distribution of venutre capital investments in China, 2009. Source: CVSource

Table 7. 2 provides a more detailed description about the regional distribution of venture capital investment in China. Top five provinces or cities that attracted most private equity investment in 2009 were Beijing, Shanghai, Neimenggu, Liaoning and

[11] The defination of eastern, middle and western comes from the document named "A notice of related policies for the development of western part of China", issued by the Central People's Government of PRC in Dec 12th 2000.

Anhui. The sum of the capital invested in Beijing and Shanghai accounts for 76.21% of the total investments. Beijing, Shanghai, Jiangsu, Zhejiang and Shenzhen ranked top five with regard to the VC investments. Again, the sum of investments in top 2 regions, Beijing and Shanghai, occupied 41.58% of the total amount. It reflects the highly regional concentration of venture capital investments in China, which to a large extent because of the fact that most venture capital firms are located in Beijing and Shanghai. As venture capital investments are typically involved with problems of asymmetric information, VC firms usually invested in companies close to them geographically for better supervision.

The discrepancy may also caused by different policies in different provinces. Generally speaking, Beijing and Shanghai provide more favourable policies for the development of venture capital, while other provinces don't. For example, in Jun 2nd, 2009 and Jan 4th, 2010, Shanghai and Beijing issued documents to encourage foreign venture capital firms open their offices in these two regions, and claimed that foreign investors would enjoy the same status as domestic firms. The favourable environment attracts more VC/PE firms, thus venture capital activities are more active in these two regions.

At last, the imbalance also comes from the fact that Beijing and Shanghai have advantages in human resources, innovation resources (these two cities have the most famous universities and research centres in China) and financial service platforms. All reasons above are in line with those that explain why some countries in Europe have well-developed venture capital market while others don't in section 5.

Table 7. 2 Regional distribution of venture capital investments in China, 2009

Region	PE Investmens		VC Investments	
	Amoutn($ million)	%	Amoutn($ million)	%
Beijing	13112.1	70.33%	1044.56	27.73%
Shanghai	1095.68	5.88%	521.67	13.85%

Jiangsu	388.7	2.08%	186.6	4.95%
Zhejiang	247.08	1.33%	126.08	3.35%
Shenzhen	50	0.27%	127.36	3.38%
Guangdong	349.83	1.88%	135.51	3.60%
Hubei	(-)[12]	(-)	84.64	2.25%
Shandong	75.49	0.40%	65.96	1.75%
Hunan	70.08	0.38%	50.65	1.34%
Sichuan	82.74	0.44%	(-)	(-)
Fujian	171.4	0.92%	(-)	(-)
Henan	191.7	1.03%	(-)	(-)
Anhui	487.34	2.61%	(-)	(-)
Xinjiang	68.09	0.37%	(-)	(-)
Chongqin	58.41	0.31%	(-)	(-)
Liaoning	515.13	2.76%	(-)	(-)
Tianjin	113	0.61%	(-)	(-)
Neimenggu	965.55	5.18%	(-)	(-)
Hainan	326.46	1.75%	(-)	(-)
Hebei	60	0.32%	(-)	(-)
Others	215.84	1.16%	1423.65	37.80%
Total	18644.72	100.00%	3766.69	100.00%

Source: CVSource

[12] Not available.

7.3 Problems of China's venture capital market

As the analysis of last two chapters show that the venture capital industry is growing rapidly in China in recent years, but the total market size of the industry is still small. In 2008, the amount raised by the venture capital industry in China was roughly 17.5% of the Europe, and the total investment amount was about 20% at the same time. There are some problems constitute the bottleneck for the development of venture capital industry in China.

Firstly, the source of fundraising in China is scarce. Figure 4. 2 reflects that various kinds of investors providing fund for the venture capital industry in Europe, including pension funds, FOF, banks and insurance companies etc. In China, however, banks, pension funds and insurance companies are still not allowed to invest in venture capital funds because of the high risks deemed by relevant regulatory government agencies. The experience of Europe shows that the opening of venture capital market to pension funds and insurance companies dramatically boost the prosperity of venture capital activities. Therefore, the Chinese government should come up with a solution so as to open the venture capital market for pension funds, banks and insurance company investors as soon as possible.

Secondly, there aren't enough exit routes for venture capitalists in China. IPOs are the only major method to divestments in China while European venture capitalists can exit through trade sales, secondary sales and repayments of loans and shares etc. The reason is that we don't have a well developed multi-level capital market which should include a strong main board, a deep secondary board and an active OTC market. As the portfolio companies of venture capital funds are usually too small to satisfy the requirement of listing on the main board, a well developed supplements like the secondary board and OTC market are extremely important for these investments. The Chinese secondary board was just launched on Oct 30th 2009, but the threshold of listing is still higher than its European counterpart, the Euro new market. Besides, the OTC market has not well developed as well. The OTC market for venture capital in China is mainly composed of provincial propriety trading

markets. However, these propriety trading markets are typically too small and lack sufficient influences nationwide. It can be noticed that almost every province has its own propriety trading market. What's more, some big or medium cities also launched one. The segmentation between these markets severely gears down the flow of information and increases the searching costs for both buyers and sellers. The Chinese government should study on how to consolidate these small markets into a large uniform one to facilitate the exit of venture capital investments.

Thirdly, the lack of related laws and regulations also negatively influence the venture capital activities in China. Till now, there haven't been any specific regulations governing the venture capital industry. As an industry with huge amount of asymmetric information, however, a comprehensive system of regulation is beneficial to all players in the market. The development history of Europe also illustrates that countries with better legal environment, including sufficient supervision, have better developed venture capital markets.

Last but not least, there aren't many intermediaries providing venture capital services in the market, which may be result from the fact the overall size of the market is still too small. In Europe, investment banks, accounting firms, law firms, consultant companies and asset assessment institutions etc. all do business related to venture capital. For example, accounting firms like PWC, Ernst & Young, KPMG and Deloitte published reports analyze the hotspot of venture capital investments every year to help venture capitalist grasp opportunities. But in China, these kinds of services are quite scarce.

8. Conclusions and Suggestions

The venture capital investments do have positive impacts on the economic growth, innovation and job creations from the perspective of Europe. The paper goes through a complete survey of the venture capital activities in Europe; analyzes the model that determines the equilibrium amount of VC investments and runs an empirical analysis on 15 European countries over the period 2002-2008. The analysis includes the public R&D expenses variable, and takes legal environments into consideration, which haven't been discussed by previous related researches. And we can get the conclusions as follows:

1. The prosperity of venture capital market needs various kinds of players. Since Europe allows pension funds to invest in venture capital funds, the market grows rapidly. In today's Europe, pension funds, banks, FOFs, insurance companies, industrial investors and governments are all active players in the venture capital market.

2. The development of venture capital needs supports from governments. From the perspective of Europe, venture capital investments are usually more active in countries with favourable policy environments. For example, the British government issues lots of encouraging policies for venture capital firms and investors, while quite few are offered by the Germany governments. As a result, although German is a bigger economic entity than UK in terms of GDP, the venture capital market in German is smaller than that in Britain.

3. The development of venture capital relies on a deep multi-level capital market, including the main board, secondary board and OTC markets. These markets serve as important exit routes for venture capitalist, thus directly influencing venture capital investment activities. The launching of the European secondary board, Euronm, in 1996 significantly boosted the amount of venture capital investments, as illustrated by Figure 4. 3. The regression outcome in section 5

also reflects a strong positive relationship between venture capital investments and the depth of the capital market.

4. Public R&D spending can be used as a policy tool by governments to boost venture capital activities. However a bad legal environment will diminish the effectiveness of the policy. As a result, the government should not only make more public R&D investments, but also try to improve the legal environment for venture capital activities.

After that, the paper analyzes the recent development of the venture capital market in China, makes a comparison with the Europe and concludes some potential problems hindering the development of VC market in China. To establish a strong venture capital market in China, experience from Europe is valuable for the government.

First, we should speed up the construction of a multi-level capital market. The regression analysis shows that the depth of capital market significantly impact venture capital activities. The increase of total capital market value to GDP by 1%, the venture capital intensity will be increased by 1.3%. Therefore the launch of China's secondary board in 2009 is a meaningful improvement of the existing capital market system and will be beneficial to the development of venture capital in China. However, we still have to study on how to found a nationwide OTC market for venture capital divestments.

Second, the government should spend more on scientific researches and education programmes. Although the Chinese government has always been stressing the importance of education as a basic strategy for economic growth since 1995, the public expenditure on education is still too low, about 2.81%-3.48% of GDP in recent years. While the amount in Europe is much higher, ranging from 3.48% (Slovakia) to 8.28% (Denmark) in 2005. R&D expenses and education expenses are important for venture capital investments in terms of the fact that they can boost innovations which is extremely important for early-stage ventures.

At last, the government should create a favourable legal environment for venture capital activities. The empirical test of Europe finds that the legal environment will significantly influence the effectiveness of the stimulation policy. If the legal environment is too tough, increasing in government spending on public R&D may have no effects on venture capital activities. As a result, establishing a good legal environment is crucial to the development of the venture capital market.

References

Andreas Oehler, Kuntara Pukthuanthong, Marco Rummer and Thomas Walker (2007): *"Venture Capital in Eruope: Closing the gap to the U.S."* In Greg N. Gregoriou, Maher Kooli and Roman Kraeussl (ed.), Venture Capital in Europe (pp. 3-19). Oxford: Elsevier.

Astrid Romain, Bruno van Pottelsberghe (2003): *"The Determinants of Venture Capital: A Panel Data Analysis of 16 OECD Countries"*, IIR Working Paper WP No.03-25.

Beck, T., Demirgüç-Kunt, A. and Levine, R (2003a): *"Law and Finance: Why Does Legal Origin Matter?"*, Journal of Financial Economics, 31(4): 653-675.

Beck, T., Demirgüç-Kunt, A. and Levine, R. (2005): *"Law and Firms' Access to Finance"*, American Law and Economics Review, 7(1): 211-252.

British Private Equity and Venture Capital Association (BVCA) (2007): *"BVCA Private Equity and Venture Capital Report on Investment Activity 2007"*, http://www.bvca.com.

Chen Si Wei (2007): *"Chinese Venture Capital Yearbook 2007"*, Shenzhen, Editor Department of Chinese Venture Capital Yearbook.

ChinaVenture (2010): *"Annual Statistics & Analysis of China's VC/PE Exits-2009"*, http://www.chinaventure.com.cn/.

ChinaVenture (2010): *"Annual Statistics & Analysis of China's VC/PE Investments-2009"*, http://www.chinaventure.com.cn/.

ChinaVenture (2010): *"China Venture Capital and Private Equity Market Fundraising Report-2009"*, http://www.chinaventure.com.cn/.

Colin M. Mason and Richard T. Harrison (2002): *"the Geography of Venture Capital Investments in UK"*, Transactions of the Institute of British Geographers, New Series, Vol. 27, No. 4, pp. 427-451.

Cumming D, Fleming G, Schwienbacher A (2006): *"Legality and Venture Capital Exits"*, Journal of Corporate Finance, Vol. 12, pp. 214 – 245.

Demirgüç-Kunt, A. and Maksimovic, V. (1998): *"Law, Finance and Firm Growth"*, Journal of Finance, 53(6): 2107-2137.

Dirk Engel (2004): *"The Performance of Venture-backed Firms: The Effect of Venture Capital Company Characteristics"*, Industry and Innovation Vol. 11, Number 3, pp.249–263.

European Private Equity and Venture Capital Association (EVCA) (2002-2009): *"Yearbook"*, http://www.evca.com.

European Private Equity and Venture Capital Association (EVCA) (2005): *"Employment Contribution of Private Equity and Venture Capital in Europe"*, http://www.evca.com.

European Private Equity and Venture Capital Association (EVCA) (2006), *"Benchmarking European Tax and Legal Environments"*. http://www.evca.com.

German Private Equity and Venture Capital Association (BVK) (2008). http://www.bvkap.de/

Gompers, P. and Lerner J. (1998): *"What Drives Venture Fundraising?"*, Brookings Papers on Economic Activity, Microeconomics, pp. 149-192.

Jan Pieter Krahnen and Reinhard H. Schmidt (2004): *"The German Financial System"*, Oxford, Oxford University Press.

Jeng L.A. and Ph.C. Wells (2000): *"The determinants of venture capital funding: evidence across countries"*, Journal of Corporate Finance, 6(3), pp. 241-289.

Jon Vislie (2009): “Lecture Note #6, ECON 4350”, Oslo.

Kuntara Pukthuanthong, Dolruedee Thiengtham and Thomas Walker (2007): *“why venture capital markets are well developed in some countries but comparatively small in others: Evidence from Europe”*, In Greg N. Gregoriou, Maher Kooli and Roman Kraeussl (ed.), Venture Capital in Europe (pp. 33-51). Oxford: Elsevier.

La Porta, R., Lopez-de-Silanes, F. and Shleifer, A, and Vishny, R. (1998): *“Legal Determinants of External Finance”*, Journal of Finance, 52(3): 1131-1150.

OECD (2000): *“Summary Indicators of Product Market Regulation with an Extension to Employment Protection Legislation”*, Economics Department Working Papers NO. 226, Organisation for Economic Co-operation and Development, Paris, France

Paul Gompers and Josh Lerner (1997): *“An analysis of compensation in the U.S. venture capital partnership”*, Journal of Financial economics, Vol. 51, Issue 1, pp. 3-44.

Richard Florida, Donald F. Smith, Jr. (1990): *“Venture Capital, Innovation, and Economic Developmemt”*, Economic Development Quarterly, Vol. 4, No. 4, pp.345-360.

Robert J. Barro and Xavier Sala-i-Martin (2003): *“Technological change: Schumpeterian Models of Quality Ladders”*, In Economic Growth (2nd Ed.), pp. 317-347, London: The MIT Press.

Samuel Kortum and Josh Lerner (2000): *“Assessing the contribution of venture capital to innovation”*, RAND Journal of Economics, Vol. 31, No. 4, pp. 674-692.

Stefano Bonini and Senem Alkan (2009): *“The Macro and Political Determinants of Venture Capital Investments around the World”*, Available at SSRN: http://ssrn.com/abstract=945312.